The Chemical Age

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NOTICES :—All communications relating to editorial matter should be addressed to the Editor, who will be pleased to consider articles or contributions dealing with modern chemical developments or suggestions bearing upon the advancement of the chemical industry in this country. Communications relating to advertisements or general matters should be addressed to the Manager.

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British Association Meetings

THE annual meeting of the British Association, which is this year being held in Liverpool, promises to be at least of average interest and importance. Occasionally, an annual meeting stands out as exceptional. Last year's attained a high level in some of the addresses. The promise, so far, for this year is of a good average rather than of unusual merit. In any event the annual assembly of British leaders of science in all its branches cannot fail to be valuable, even if only as a register of the present state of knowledge, and while every meeting brings its after-crop of criticism every one also makes its contribution to progress. The Liverpool University buildings form a very suitable place for the meetings, lectures, and discussions in the wide range of scientific subjects which are covered by the Association, and, as usual, a very full programme has been arranged for the various sections which cover no fewer than thirteen branches of science, ranging from mathematics and engineering to agriculture and education. The programme of the Chemistry Section, which is under the presidency of Professor F. G. Donnan, deals largely with academic subjects, as is, perhaps, to be expected in questions of the advancement of science, since progress in the theoretical field usually, but not always, precedes that in industrial applications. The practical man is not being neglected, however, for a number of valuable lectures dealing with manufacturing problems are in the programme, as well as visits to neighbouring works and what promises to be an instructive exhibition of applied science.

Both the address of the President (Sir Ernest Rutherford) and that of Professor F. G. Donnan, the President of Section B (Chemistry), abstracts of which appear in this issue, are of exceptional interest. The latter deals with "Some Aspects of the Physical Chemistry of Interfaces," and it leaves an impression of the vast amount of detail work which has been carried out and is still being carried out by investigators in what is a highly specialised field of pure chemistry. The subject of interfaces includes, of course, the relationships between solids and liquids, or two non-miscible liquids, or liquids and gases, and so on, a subject which is full of difficulties and of great theoretical interest. It is not without practical application, since any investigations which establish the fundamental facts concerning emulsions, foams, froths, oil films and the like, as soon as definite results and relationships are established, are seized upon by the industrial chemist dealing with oils and fats, and employed by him either to solve difficulties in the manufacture of his products, or to assist him in obtaining new solvent, lubricating, or detersive agents. In view of the attention which is now being given to the chemistry of the manufacture and application of the oils and fats, Professor Donnan's address is opportune and valuable as showing something of the mass of work which has to be done by the pure chemist before single facts of industrial importance are won. In addition to this there is another aspect which is hinted at in the address itself. Professor Donnan forsees that the elucidation of some of the problems associated with surfaces and interfaces will have considerable effects in our knowledge of the functions of the various cellular structures of which living organisms are composed—knowledge which will undoubtedly be of great value to the medical profession.

Sir Ernest Rutherford's presidential address on "The Electrical Structure of Matter" also gives an impression of the large amount of scientific work which is being carried out to-day, and in this case it has been done with even less of the material end in view. The possibilities of the knowledge of the electrical structure of the atom proving of any industrial importance were always speculative, and now seem more so than ever, for Sir Ernest Rutherford states that as a result of the more recent investigations there has been a gradual change from the point of view that atoms contained stores of energy which could be obtained in the free state when they were disintegrated. This pronouncement may be a disappointment to some, especially the more sensational writers and inventors, but we do not imagine it will make any

difference to the work of the genuine investigator. The review of the work of the past twenty-five years on the nature of matter, which forms the basis of the President's address, shows that this period has been truly prolific in work and discovery in physics, well meriting the appellation of "the heroic age." Sir Ernest Rutherford, in the broad vision of the development of his science as a whole, shows himself to be a not unworthy successor in the great line of investigators who have added to our knowledge of this, the fundamental science.

The Chemist's Point of View

THE letter we publish from Mr. F. Hulse on Professor Green's resignation strikes us as a piece of quite good criticism in the sense that it is sincere, that the writer knows something of dyestuffs chemistry, and that it emphasises the chemist's point of view, which, of course, nobody desires to ignore. The difficulty, however, is to relate what he says to the facts of the present situation, so far as they are known. On some points all parties are agreed from the outset. Everyone regrets the resignation of Professor Green, whatever may be their knowledge or opinions of the causes. Everyone, again, will regret the necessity for an economy which may result in the restriction of the research staff and the unemployment of several chemists. But during the past few years the British Dyestuffs Corporation is not the only concern which has had to consider carefully its expenditure on research and other departments. Private firms have had to economise, not because they undervalued this or that branch of their work, but because funds were limited, and had to be carefully apportioned. One of the fundamental facts in the present situation is that funds are limited, owing largely to the depression in the colour-using trades, and if they are not equal to maintaining the present establishment either reductions must be made or the money must come from some other source. So far no one who bewails Professor Green's resignation as a disaster has shown how the money required for the maintenance of Professor Green's large and expensive staff is to be provided. In deciding to retrench, therefore, the Corporation is doing under necessity what numbers of private employers have been similarly compelled to do.

The other point made is that the chemical staff is not sufficiently consulted. On this point it is impossible to judge unless one knows the conditions demanded by Professor Green and the conditions laid down by the Corporation. That the directorate employ chemists and then ignore the results of their work seems at least unlikely. It is not so unlikely that when the chemist makes his recommendations the directorate may have to qualify them by other considerations with which the chemist is not immediately concerned. The practical point, we believe, is one we have already discussed. It is admitted that in theoretical knowledge we are nearly if not quite equal to Germany, but that in commercial production we are a long way behind. The research department must always, of course, be ahead of the production department, as advanced mobile troops must always be ahead of the main army. But the art of generalship is so to arrange the degrees of distance between them that they never lose touch. Unless this is done, unity of movement and of control is lost, and the army becomes a group of detached units instead of one machine. The practical issue in this case seems to be whether research should be pushed ahead to the neglect of commercial production or whether the latter should now be developed and brought closer up to the advanced research work. It is a question both of policy and of funds, and until the facts of the situation are known judgment may be suspended.

In reference to a new dyestuff, our correspondent remarks that "it will require a chemist to make it and to understand it." To make it in the first instance on a laboratory scale is, no doubt, the function of the chemist, but between laboratory production in terms of ounces and commercial production in terms of tons there is a very wide difference. In the latter respect we have reason to believe our position is behind that of Germany, and the effort now being made to improve our knowledge of production, plant, and all the little "working tricks" that may make the difference between profitable and unprofitable manufacture, seems to us good policy.

Both in this country and in America the policy followed in the attempt to create a national dyestuffs industry has had from time to time to be revised. At the outset, in both cases, the attempt was made to produce as large a range of dyestuffs as possible; the policy was extensive rather than intensive. The result was not satisfactory. By dispersing their resources over too wide a programme quality was sacrificed and national reputation suffered. Latterly the policy has been to concentrate on fewer products, to put their quality beyond suspicion, and to produce them as cheaply as possible. This policy has been so far successful that in this country we have overtaken Germany to the extent of, say, 75 to 80 per cent. of her output. To bring our commercial production up to the full 100 per cent. may be a more urgent need than pushing ahead of Germany in research while still far behind her in practical production. It is not that anyone desires to restrict research but simply that works production must keep pace with laboratory discoveries, instead of lagging so far behind. And with limited funds to cover both branches those responsible must balance one claim against the other. The directorate of every concern has again and again to face this troublesome problem.

Nitrogen Fixation by Hydrolysis

IT must be said that in America there is never any lack of effort to probe the possibilities of processes which chemists in this country would probably regard as something of the "wild cat" order. We are not sure, however, that the American viewpoint is not the correct one. It has its sporting element, and it seems to take for granted that because a process has proved insoluble in the past, and even if it appears to present almost insurmountable complexities, it should not be finally regarded as impossible until it has been tried out in the light of knowledge as it stands to-day. Many of the greater discoveries have been made by accident, and the American workers seldom seem to

lose hope in the quest for those missing links which have evaded preceding efforts, and which mean all the difference between success and failure. The above thoughts have come into our mind after reading in one of our American contemporaries some "intriguing" suggestions put forward by Messrs. K. G. Falk and R. H. MacKee. These workers point out that according to a valence theory published a number of years ago, the two atoms of nitrogen in such a molecule as the nitrogen molecule differ from each other, one having a negative and the other a positive character. If this is true, then from the analogies drawn mainly from the reactions of organic chemistry, the nitrogen molecule would be hydrolysed in such a way that from each molecule one ammonium radicle and one nitrous acid radicle would be formed. Put simply, the equation representing the reaction would be as follows :—

$$N_2 + 2H_2O = NH_4NO_2$$

Experiments were conducted which proved that nitrogen was hydrolysed in this manner, and it was contended that if the hydrolysis is of the simple type indicated by the theory, then increases of pressure of nitrogen or change of solvent so as to increase the solubility of nitrogen in water should increase proportionately the amount of hydrolysed nitrogen obtained. Experiments using nitrogen at 1,800 lb. pressure gave the expected increased percentage of ammonia and nitrite.

So far an opportunity for carrying out the reaction at very high pressures such as those used by Claude has not been found, but the investigators tell us that if proper catalytic agents were known for this reaction —that is reagents which would give a high reaction velocity—it would seem as if the above process has a possibility of competing with the present Haber and Claude methods in that it is very much easier to work at ordinary or low temperatures with water and nitrogen than it is to work at red heat with gases such as the nitrogen-hydrogen mixture now used. Neither the method nor the chemistry of it are by any means new, for a nitrogen fixation process operated on similar lines was suggested more than 80 years ago, but one cannot fail to find interest in a proposal which, in contrast with present-day methods, altogether obviates the use of high temperatures, and which could possibly be conducted at atmospheric temperatures. Admittedly the proposition presents difficulties of a considerable order, but even should the idea never materialise we have at least been given something to think about.

Abnormal Steam Pressures

CHEMICAL engineers cannot fail to be struck with the recent advances which have been made in connection with the generation of steam at extremely high pressures. Rather more than a year ago reports were received from Germany which appeared to confirm previous claims that steam generated up to a pressure of 900 lb. per square inch, combined with judicious superheating and provisions for utilising the heat of the exhaust, afforded a means for effecting notable economy in fuel. The proposals are not, of course, altogether novel, for certain experiments were carried out over ten years ago, but last year the whole matter was resuscitated, and not only was it definitely decided to erect plant of the kind in Germany, but a good deal was heard of similar intentions at a large industrial chemical works over here. During the past summer, moreover, it was announced that an order had been placed by a prominent Chicago firm for a boiler designed to work to a pressure of 1,200 lb. in connection with a high-pressure turbine itself exhausting at 300 lb. into mains which would supply a further series of turbines working at ordinary pressures.

Perhaps some of the most important work is that which has been taking place in Sweden, where pressures up to 1,500 lb. per square inch have been employed with, it is said, an efficiency of steam generation of 80 per cent. Some exceptional ingenuity of design has been shown by the Swedish engineers who, in one instance, have introduced continuously revolving horizontal tubes in which the steam is generated. Centrifugal force plays its part in maintaining the water in contact with the inner surface of the tubes, while the steam travels out by way of the hollow central core formed by an inner tube of smaller diameter. To the average engineer the practical difficulties associated with revolving tubes of this nature would seem to be almost insurmountable; but in this case the problem appears to have been overcome by employing packing rings which operate in oil under pressure. The development of exceptional steam pressures of the kind promises almost to revolutionise many of the processes demanding steam with which the industrial chemist is in daily touch, and it is to be trusted that the pioneers among users in this country, to whom we have referred above, will not hesitate to give others the benefit of their experiences with so important a novelty.

Points from Our News Pages

Professor Armstrong intervenes in the "Random Reflexions" to explain his views on water and hydrone (p. 278).

Letters are published on "Professor Green's Resignation," by Mr. F. Hulse, and on "Chloramine-T" (pp. 279, 280).

Summaries are given of the Presidential Addresses by Professor F. G. Donnan and Sir Ernest Rutherford at the British Association Meeting in Liverpool (p. 282).

Further notes on the exhibits at the Machinery Exhibition are given (p. 285).

According to our London Market Report the improvement in demand for chemicals has been maintained and appears to be growing (p. 291).

The heavy chemical market in Scotland remains quiet, according to our Market Report (p. 294).

Book Received

THE A.B.C. OF ATOMS. By Bertrand Russell. London: Kegan Paul, Trench, Trubner and Co., Ltd. Pp. 175. 4s. 6d.

The Calendar

Sept. 12-19	British Association for the Advancement of Science: Ninety-first Annual Meeting.	Liverpool.
14-19	Industrial Welfare Society: 4th Annual Lecture Conference.	Balliol College, Oxford.
17	Institution of Rubber Industry, 8 p.m.	Engineers' Club, London.
17-18	Iron and Steel Institute.	Milan.
19	Mr. W. J. U. Woolcock: Broadcasting address on "Applied Chemistry in Modern Life."	London (2.L.O.)

The Hydronodynast

(A Disquisition on the Art of Washing and the Shock-tactics of the Goddess Hydrone)

De Lunatico Inquirendo By Henry E. Armstrong

[*We have thought it well to interrupt publication of the "Random Reflexions" in order that Professor Armstrong may explain his views on water.*—Ed. *C.A.*]

> "It is most satisfying to find a field of study in physics which has been in confusion for more than fifty years brought under complete control through the obtaining of experimental results which conform precisely with the predictions of the kinetic theory. While the discovery of new and as yet unexplained phenomena, like those connected with the facts of 'quanta' and relativity, are making physics at present intensely interesting, it is the foregoing type of successes, clearing up, as they do, former mysteries and continually widening the field of fully explained phenomena that gives us confidence in its methods and faith in its values for the future of the race."—*Stokes' Law of Fall Completely Corrected* (R. A. Millikan).

There are old fields of study also in chemistry in which confusion has reigned too long—if we were to clear up these, our chance of progress in newer fields and generally might well be greater and we should be more justified in speaking of our subject as a science.

The Reader I would call Randy rather than Random, in the last of his Randy Reflexes, refers, in kindly terms, on the whole, to my communication to the Royal Society on *The Origin of Osmotic Effects*, wherein I have set forth what I dare venture to call a theory of solutions—not a mere speculation or hypothesis, such as the necromancer Arrhenius has given us—as in my considered, humble opinion, it fits the facts, not a mere tithe of them; it is an exercise which may be played in accord with the rules of the Ancient and Royal game of chemistry, familiar and much practised in my younger days but scarce known to the present-day made-believers and worshippers of the hydrogen Ikon. Either there is something in it or it is the purest moonshine: in which latter case I am clearly a public nuisance and should be relegated to an asylum, so the sooner a Commission in lunacy can be issued the better. I have reached an age of discretion at which I resent being buried, even decently, in Royal Society archives. Long-suffering, during many years, I propose—following an example set me by my juniors—to be my own valuer and challenge a contest of criticism. I trust I may not meet with the refusal I encountered at Cambridge, when I cast my gage at the feet of the Brian de Bois-Guilbert of Transatlantic Chemistry. He would not face the lists in armour, let alone fight in his loincloth: yet his honour was so far pricked, that he told us he would go home and read. We live in hopes that he will mark, learn and inwardly digest the vast mass of statement which drifts like Sargasso weed upon the ocean of our science, uncodified and uninterpreted; that when he quits his armchair for Copenhagen he will have cast off the adsorbed layer of ritual and pretence which has so long hampered thought and progress in chemistry and be prepared to put trust in the sane and simple faith which so well served our forefathers; indeed, that he may even be prepared to say of the arrogant school he has so long favoured—

> Nothing but th' abuse
> Of human learning you produce;
> Learning, that cobweb of the brain,
> Profane, erroneous and vain;
> A trade of knowledge as replete,
> As others are with fraud and cheat;
> An art t'incumber gifts and wit
> And render both for nothing fit;
>
> A cheat that scholars put upon
> Other men's reason and their own;
> A fort of error to ensconce
> Absurdity and ignorance,
> That renders all the avenues
> To truth impervious and abstruse,
> By making plain things in debate,
> By art perplex'd and intricate:

I am called an old heathen worshipper of Hydrones: yes, I hold that there is nothing like water, though I would fain remain a freeman, both in body and soul, so that I might temper the former with the mildest and most beneficent of hormones, preferred of Noah of old, at times when spirit calls to spirit.

Whether upon the Alde or the Atlantic, I am ever haunted by Longfellow's sonorous lines on the Spanish ballad

> Of the noble Count Arnaldos
> And the sailor's mystic song.
>
> Telling how the Count Arnaldos,
> With his hawk upon his hand,
> Saw a fair and stately galley
> Steering onward to the land;
>
> How he heard the ancient helmsman
> Chant a song so wild and clear,
> That the sailing sea-bird slowly
> Poised upon the mast to hear.
>
> Till his soul was full of longing
> And he cried with impulse strong,
> "Helmsman! for the love of heaven,
> Teach me too that wondrous song!"
>
> "Would'st thou," so the helmsman answered,
> "Learn the secrets of the sea?
> Only those who brave its dangers
> Comprehend its mystery!"
>
> In each sail that skims the horizon,
> In each landward-blowing breeze,
> I behold that stately galley,
> Hear those tuneful melodies;
>
> Till my soul is full of longing
> For the secret of the sea
> And the heart of the great ocean
> Sends a thrilling pulse through me.

The mysteries thought of by the poet are those of surface and companionship, such as Conrad and Melville (of Moby Dick fame) love to picture and picture so well. We chemists are not sufficiently mindful of the great fact—let no one deny it—that, if water were not, there would be no chemistry; so we put little chemistry into water—it has not even a chapter to itself in most text-books. Mellor alone has real regard for its charms, though he scarce considers it as a chemical. The physical school pays no respect to its potency and is thereby damnified. It is strange that we should be so apathetic towards a substance so universal: one which we drink in large quantity—if wise—and yet do not reckon as a food; one we wash with—or try to if we live in London or other hard-water area—but as a mere matter of habit: though aware of its potency as a solvent, we have no special curiosity as to why it is so active.

We are forced to recognise that chemists are victims of "that progress of science which is to destroy wonder and in its stead substitute Mensuration and Numeration." Hydrogen-ion-concentration, not the nature and play of molecules, fills our thoughts. Like the novelists, we tell fancy stories of ships that sail upon the surface of its waters—of the substances water dissolves—yet the ocean itself is but barely mentioned: ocean exploration and the wonders of water alike have no place in the schools. As islanders, we love to live upon the sea and feel that we have our being in its substance, even in its salt: indeed, we not only go down to the sea in ships but overcrowd the seaboard during the summer—only to disport ourselves at its brink, often in vulgar ribaldry. Geologists recognise the great mechanical value of water: let us hope that, in the next generation, chemists too will be trained to do homage to its might.

If only we could free ourselves from the contempt of familiarity, we should proclaim water to be the most active chemical we have—oxygen in its most active form; the finest of all chemicals, though not counted among the Board of Trade

'fines.' Yet gross water is for the most part inert: the activity resides, if I be not mistaken, in an entirely minor constituent, HYDRONE, the unit molecule we represent by the all significant formula

$$H_2O$$

Unfortunately, the immense significance of formulæ, their molecular import, is never taught and rarely realised: they serve mainly as mere *memoria technica*, not sufficiently as the embodiment of character.

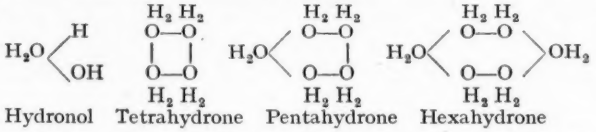
Let me endeavour to make clear the details of my new heresy.

1. My fundamental postulate is, that all chemical interactions are electrolytic in character and take place in a complex circuit of three components—two would not give the necessary slope of potential down which a discharge of energy could take place.

2. The physicist, who is a person of simple and confiding nature, regards 'change of state' as a physical phenomenon, due to the diminished mobility and close approach of molecules. The chemist, if he think at all, must regard it as due to the occurrence of chemical change, his mind being full of residual affinity. If my postulate be granted, it follows that water cannot be produced by the mere condensation of hydrone but only under conditions which permit of the formation of an electrolytic couple—not at all in the gaseous state but only in presence of a liquid or solid. In principle, meteorologists admit that such is the case—indeed they now think of salt-nuclei as essential to the formation of clouds.

3. Given water—it is unnecessary to speak of it as liquid and we may well always apply the term ice to the solid state—my first postulate is, that it is normally saturated with the gas *Hydrone* and that the vapour pressure, either of water or of an aqueous solution, is the measure of the proportion of Hydrone molecules present in the liquid.

4. I assume that, besides Hydrone, water contains several polyhydrones, in proportions which vary with the temperature. The nature of these can only be inferred by analogy, best by comparison with the polymethylenes, hydrone being the oxygen equivalent of methylene, CH_2. I doubt, however, whether water contains the equivalent of ethylene and incline to the belief that, in place of this, there is present an active molecule which is best termed *Hydronol*. As the number of polymethylenes is limited, so probably is the number of polyhydrones. Taking into account the character of hydrated salts, the following, at least, may be regarded as not unlikely constituents of water:

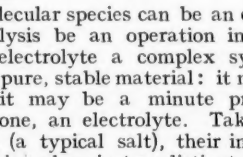


Hydronol Tetrahydrone Pentahydrone Hexahydrone

Water, not being a single substance, has no proper symbol: gross water is sometimes represented by *Aq*; it were well to reserve the symbol for this use.

5. The general equilibrium, in a solution, must depend not only upon the nature of the solute but upon the proportions in which this is present: it must be strangely subject to variation. The one steady index of its state is the vapour pressure. For the present, it may be left an open question, whether a given vapour pressure correspond with a particular general equilibrium.

6. No single molecular species can be an electrolyte, if—as I assume—electrolysis be an operation involving chemical change and the electrolyte a complex system. Water is inconceivable as a pure, stable material: it must contain some material, though it may be a minute proportion, constituting, with hydrone, an electrolyte. Taking hydrone and hydrogen chloride (a typical salt), their interaction is to be represented as taking place in two distinct ways:



The cardinal sin of the Arrhenius school is belief in the practical inviolability of the hydrone molecule, the contention that only the molecules of the dissolved substance are in some clandestine way ionically disrupted—maybe entirely, in very dilute solutions. This is an assumption, a distinction, against which the soul of the chemist cannot but revolt: the complete analogy in behaviour of hydrogen chloride and hydrone is so abundantly demonstrated. The reply will be made, that the majority of chemists do not revolt but live happily in the belief. To which the only answer can be, that if chemists be not soulless, like all but a few human beings, they are credulous and have sold their souls for a mess of mathematics. Of late years, an exaggerated importance has been attached to mathematical formulae and pseudo-mathematical display has usurped the place of steady, experimental inquiry and a reasoned analysis of results. Chemistry, in fact, like the black-currant bushes, has fallen a prey to a parasite.

Here may well end our first lesson.

Professor Green's Resignation

To the Editor of THE CHEMICAL AGE.

SIR,—Your leading article on Professor Green's resignation is certainly surprising, especially in a chemical journal. If the chemical press does not support chemists, to whom must they look? Certainly the facts should be stated, but you lead your readers to think that Professor Green's resignation is an isolated one at British Dyestuffs, ignoring those who have already left and, what is more important, ignoring the few organic chemists we have and that most of these with a knowledge of the dye industry have already passed through the laboratories of the British Dyestuffs Corporation, Ltd. Not until the public has realised how technical and involved the manufacture of dyestuffs is will the difficulties of the dye chemist be understood. When it is stated that dye manufacturing can be successfully directed without protective legislation by business men who cannot tell the difference between Aniline Black and soot, surely such speakers cannot understand the true position.

It is very obvious that if the chemists and staff discussed business propositions with the directors in Chinese, progress would be impossible. But apparently it is not known that dye chemistry is fundamentally different from school chemistry. To take a brief extract from the last patent of Professor A. G. Green:—

"N-Methyl-w-sulphonic acids of dimamido-azo compounds are obtained by sodium sulphide reduction of compounds of the general formula $X\text{-}N_2\text{-}Y\text{-}N_2\text{-}Z\text{-}NH.CH_2\text{-}SO_3H$ (in which X contains a paranitro group) the N-methyl-w-sulphonic groups remaining intact; a second w-sulphonic residue can then be introduced into the molecule by treatment with formaldehyde bisulphite. Examples are given of the reduction with cold sodium sulphide solution of the monozao dyes from diazotised paranitraniline and the sodium N-methyl-sulphonates of aniline, 2-amido-4-cresolmethylether and alpha naphthylamine."

Can you, sir, express an opinion on this patent? Can a business man do so? Such, then, was the absurdity of the position of Professor Green, Professor Robinson, Dr. Cain, Dr. Levinstein, Dr. Forster, and other chemists who have left the British Dyestuffs Corporation, Ltd. If the particulars of the manufacture of the most valuable new dye to be produced during the next century were read before our business men, the ability to give a decision would be as negligible as placing such a treatise in writing before a blind man. Such a dyestuff will sell itself, but will require a chemist to make it and to understand its value.

It is often stated: "But the chemist is not a business man." The wealth of Germany has been made by chemists and not from the natural resources as in England. As an example, Germany bought our crude coal tar for one-tenth of a penny per lb. and sent it back in the form of dyestuffs and drugs, for which she received shillings per lb., thus increasing the value of our raw materials a hundred-fold and sometimes one thousand-fold. That is real production of wealth without eating Nature's gifts, which we did when we sold coal tar with its latent wealth. Moreover, chemists own and organise most of the big dye manufacturing works. How

have the successful dye making firms been governed? That is the acid test. The most successful dye making firm in the world has only one director who is not a Doctor of Science. But even these directors realise the vastness of dye chemistry because they understand what it means; therefore they have a subsidiary directorate of Doctors of Science in a consultative capacity. In addition they employ several hundreds of experienced chemists. Should a chemist be a director of a chemical and dye manufacturing works? The test has been applied—compare the results.—Yours, etc.,

F. HULSE, (*Director*, F. Hulse & Co., Ltd.)

Leeds, September 5.

Chloramine—T

To the Editor of THE CHEMICAL AGE.

SIR,—As sole agents in the United Kingdom and the Colonies for the Saccharin-Fabrik, Aktiengesellschaft, vorm. Fahlberg, List and Co., Magdeburg-Suedost, we were much interested in the article in your issue of August 18, on "The Manufacture and Uses of Chloramine-T," and we would wish to compliment your contributor on the lucidity with which he treated his subject. The letter in your issue of September 8, from Messrs. Boots Pure Drug Co., Ltd., if anything, confirms your contributor's remarks as to the position of Chloramine-T in this country. That the demand for this antiseptic has been fully met so far by home makers may sound gratifying, but the gratification is somewhat tempered when one remembers that the public demand is so far very small. We doubt whether one man in a thousand has ever heard of it. The demand for Chloramine-T so far compared to that for other disinfectants is but infinitesimal. We would venture to suggest that were the public made to realise the value of Chloramine-T by advertisement and propaganda, and were their demand for it to grow to the dimensions of their present consumption of other antiseptics, then home makers would be quite incapable of supplying it in sufficient quantity.

In Germany our principals, the Saccharin-Fabrik, have been producing Chloramine-T under the name "Mianin" at the rate of some 30 tons per month. This has nearly all been consumed on the Continent. Acting under our representations, however, our principals have now agreed to ear-mark a considerable proportion of their output for this country and the Colonies. They would even be prepared to grant sole deliveries and selling rights of their product to any organisation sufficiently strong and large to be able to do their product justice. We may further mention that one of the biggest Continental firms for toilet preparations, etc., is now manufacturing and selling a whole series of toilet antiseptic articles in which Chloramine-T is the antiseptic ingredient. This opens up a vista of similar large manufacturing possibilities for English and Colonial makers of toilet articles.—We are, etc.,

RONSHEIM AND MOORE.

11a, Wormwood Street, E.C. 2,
September 10.

Degrees for Scientists at Liverpool

DURING the visit of the British Association to Liverpool the degree of Doctor of Science (*honoris causa*) is to be conferred by the University of Liverpool on seven distinguished men who are taking part in the Association's meetings. The names are the following:—

Sir Ernest Rutherford, F.R.S., this year's president of the Association; Mr. Ernest Howard Griffiths, F.R.S., general treasurer of the Association; Professor J. C. M'Clennan, F.R.S., professor of physics in the University of Toronto; Professor Niels Bohr, professor of physics in the University of Copenhagen; Professor Gilbert N. Lewis, professor of chemistry in the University of California; Professor G. Elliot Smith, professor of anatomy in the University of London; Dr. Johannes Schmidt, director of the Carlsberg Laboratory, Copenhagen.

Sir Charles Scott Sherrington, last year's president of the British Association, received the honorary degree of D.Sc. from the University of Liverpool last year.

The ceremony will take place in the Arts Theatre of the University on Monday, September 17, at 2.15 p.m.

The Use of Non-Ferrous Metals

THE Institute of Metals opened its autumn meeting in Manchester on Tuesday. At the first session, Lieutenant-Colonel Sir Henry Fowler read a paper on "The Use of Non-Ferrous Metals in Engineering," in which he said he was afraid that the immensely important research work on non-ferrous metals which was now being carried out was not appreciated as it ought to be, particularly by engineers. One reason, perhaps, was that the field of research was so wide. Another reason was that in many engineering works alloys were bought as alloys, and even the castings were bought. This was satisfactory if the quantities were small and if the articles were manufactured by those who knew the properties of what they were making. Nevertheless, he considered engineers should keep in touch with research into the problems of non-ferrous metals, the results of which, as the experiences of the war had vividly illustrated, were extremely useful in practical application. This was notably so in regard to aluminium. Aluminium itself was not a sound engineering proposition. Too much was expected of it in the early days, and we were now suffering the results of that disappointment. But aluminium alloys were undoubtedly going to be used by engineers more and more as time went on.

Inquest on a Rubber Mixer

IN the resumed inquest on a rubber mixer employed at W. T. Glover's Works, Trafford Park, Manchester, which was adjourned owing to the suggestion that the cancer which caused death might be due in some way to poisoning arising from the work, evidence was given that the deceased had been employed in handling a compound known as "accelerene." Mr. Dixon, the works chemist, said the company began to use accelerene, experimentally, about ten years ago. Only very small quantities were used, in a paste, of which 50 to 60 per cent. was water. In 1922 about 37 lb. of the paste was used each month. The whole of that did not pass through one man's hands. Mr. Vleis, a chemist employed by the British Dyestuffs Corporation, said accelerene was the trade name for a derivative of benzene, which was obtained from coal-tar. There was absolutely no tar in it, and he had never heard of anyone being poisoned by it. Dr. Renshaw, of Manchester, said that coal-tar had been shown to be capable of producing cancer experimentally in mice, and at present experiments were proceeding to ascertain what fraction of coal-tar was capable of causing cancer. It was significant that one witness had stated that there was a certain amount of skin irritation resulting from accelerene. If that were so it was very important, as one of the predisposing factors to cancer was chronic inflammation. The Coroner returned a verdict of death from natural causes. Accelerene seemed to him to be so far removed from any large amount of coal-tar that he could not think that he would be justified in coming to any other decision.

Improved Safety in Mines

THE first report of the Safety in Mines Research Board which has just been issued shows that a remarkable decrease in the number of accidents from various causes has occurred during the years reviewed in the report which deals with figures from 1873 onwards. The number of fatalities in the ten years ending 1920 was three-sevenths the number killed in the ten years, after allowing for the difference in the numbers employed. Apart from general improvements in mining practice, states the appendix, the enormous reduction in losses due to explosions of fire damp or coal dust may be traced to the results of experiments at Altofts and Eskmeals, relative to the stone dusting and watering of mines, to the regulations relating to the use of safety lamps in gassy pits, to the arrangement for searching men, and to the regulations dealing with the use of explosives, electricity, and machinery underground. Any large reductions in losses in the future, it is indicated, will come mainly from the effects of such movements as the "Safety First"; although research and improvements in mining practice should also contribute to this end. From the views of the Divisional Inspectors of Mines it would seem that more than one-third of the fatal accidents in a given year (1921) were preventable by action of management or workers.

Methods of Water Purification

A Lecture by Mr. J. P. O'Callaghan

In a paper on "Modern Methods of Water Purification" at the Shipping, Engineering and Machinery Exhibition, Olympia, on Friday, September 7, Mr. J. P. O'Callaghan, F.C.S. (of United Water Softeners, Ltd.), briefly reviewed the leading methods which are successfully practised at the present time in the treatment and purification of fresh water supplies for both potable and industrial purposes.

The treatment required for the numberless applications of water in industrial life was almost protean in its diversity, and called for a high degree of chemical and engineering skill and experience. A water might, in its untreated state, contain substances that would be helpful or even necessary for the manufacture of one product, but the same water might be extremely objectionable for another manufacturing process. The author summarised the leading methods used nowadays for water treatment as follows: (1) Sedimentation and filtration; (2) Lime-soda softening by the cold process; (3) Lime-soda softening by the hot process; (4) Permutit softening; (5) deconcentration; (6) de-gassing; (7) evaporation; and (8) boiler compounds.

Sedimentation Process

Dealing with sedimentation first, Mr. O'Callaghan described in detail, with the aid of lantern slides, a combined sedimentation and filtration plant recently put into operation at the Beckton works of the Gas Light and Coke Company, capable of dealing with 4,000,000 gallons of Thames water per day, which was tidal and frequently excessively turbid. As to chemical treatment of this water after filtration a definite proportion of the total incoming flow passed through a smaller weir into an automatic measuring apparatus fitted with a chemical container, and the chemical valve fixed to the latter was adjusted to deliver the exact quantity of lime to effect coagulation and precipitation of the suspended silicious matter contained in crude Thames water. The filtering medium employed was a specially sifted and suitably graded mined quartz sand supported on a bed of double-washed and graded gravel. The filter beds were cleansed with air and wash-water and restarted to work within the space of ten to twelve minutes. The coagulating and sedimentation tanks, filters, platforms, chemical house, inspection chambers, channelling, filtered water sump and wash water tower were of reinforced concrete construction. The floors of the pump room and the upper and lower platforms of the filter house were laid with terrazzo, and green glazed brick coping was laid around the filter tanks and plattorms. The plant was one of the largest ever put to work, and, by its use, the Gas Light and Coke Company relieved the London water supply of over a a thousand million gallons per annum.

Lime-Soda Softening

The lecturer then dealt briefly with lime-soda softening both by the cold and the hot processes, and showed slides of a number of purification plants which have been installed in various parts of the country for industrial purposes. No exhaust steam from auxiliary plant, he said, should be allowed to go into the atmosphere, but should be utilised to raise the temperature of the feed water. Approximately every 11° rise in the temperature of the feed water produced by heat which would otherwise be wasted saved 1 per cent. of fuel. The most economical method of utilising the exhaust steam was to soften and heat the water in the same plant. The oil in the exhaust steam was effectually removed by the lime used in the softening process, and the raised temperature of the water accelerated the softening reaction. By this means hot, soft, clean feed could be supplied regularly to the boilers, at a cost of merely a few pence. The advantages of the hot process were that chemical reactions were more rapid and the precipitates settled more quickly; there were less troubles from after-precipitation; less danger from priming or foaming, as there were less suspended solids carried into the boiler; a hot softener also served the purpose of a feed water heater, thereby saving fuel and space by combing a heater and a softener; and the process dispelled dissolved gases and obviates corrosion caused by these constituents.

The Permutit Process

Softening by the Permutit Zeolite process was then dealt with. The name "Zeolite" was applied to the hydrated silicate of alumina combined with sodium, potassium, calcium, magnesium and other metals. These substances possessed the remarkable property of exchanging their metallic bases for others under appropriate conditions of contact and of effecting the exchange in the reverse direction. For instance, a zeolite containing sodium as its base was able to replace the sodium with calcium if exposed to contact with a solution of calcium salt. When the calcium zeolite had been formed, it could be readily reconverted into the sodium salt by similar treatment with a solution of sodium chloride. By the power of base-exchange which Permutit possessed—"Permutit" was the name adopted for the water-softening zeolites—both calcium and magnesium were completely removed from water which had passed through a Permutit softener. All traces of hardness disappeared, and the water, when tested, gave a ready lather with a minimum quantity of soap. The softeners were without moving parts, the entire process consisting of the simple filtration of the hard water through a bed of the Permutit material. The installation of plant of the largest size, therefore, presented little difficulty, while, as regards the Permutit itself, depreciation was a practically negligible item, and the labour required to operate the plant was exceedingly small. As the softening power of a Permutit plant was drawn upon by the water itself in exact accordance with its hardness and its rate of flow, it followed that Permutit softening precluded the possibility of undertreatment or overtreatment.

The base-exchange softening action continued until the active sodium in the Permutit molecule had been entirely replaced by calcium and magnesium. When this point had been reached, regeneration was effected by passing a solution of sodium chloride slowly through the filter; by this means the calcium and magnesium, as soluble chlorides, were expelled from the Permutit, their place being taken by sodium from the salt solution, thus reconstituting the original sodium Permutit, which was then as fresh and active as when first put to work. The alternating cycle of softening and regeneration was capable of indefinite prolongation.

A More Rapid Type

Another type of Permutit had recently been introduced for industrial use. This new material, named "Permutit B," differed from ordinary Permutit both in physical characteristics and molecular constitution, these differences causing a radical change in the timing of the periodic cycle of softening and regeneration, and enabling day and night continuous duty to be performed by one unit only instead of two. In the case of ordinary Permutit a single unit was usually designed to soften continuously for a maximum period of ten or twelve hours, and it then required an equal length of time for regeneration. Therefore, day and night working involved the employment of two units. In the case of Permutit B the plant was designed to operate for periods varying from three to six hours at a time and was then completely exhausted. The material, however, was capable of extremely rapid regeneration, and a large industrial unit could be completely regenerated and recommissioned in an hour. It was, therefore, rapidly regenerated at the conclusion of each softening period. Although the actual base-exchange activity of the new material was somewhat less than that of the ordinary Permutit, this was amply compensated for by the more rapid action of the material in both directions—i.e., during softening and regeneration.

In many respects softening boiler feed water by means of zeolite was ideal. The method was not applicable, however, to all conditions, and careful preliminary investigation should be made of the quality of the raw water supply, the operating conditions of the boilers and the service to be rendered. The question could only be satisfactorily decided in the light of a reliable analysis of the water, due regard being paid to the proportions of temporary and permanent hardness, the boiler pressure, type of boiler, etc.

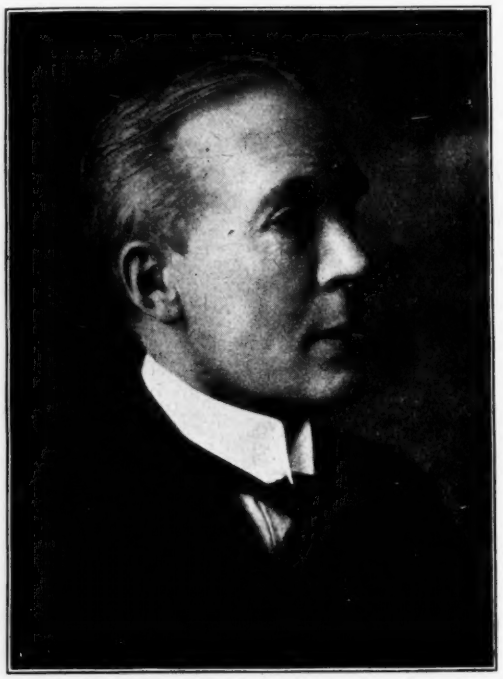
The qualities of water used in various industrial processes, and the constituents which it was necessary to eliminate in each case, were then discussed, and, in the final part of the paper, the author dealt with boiler compounds, contending that the use of these did not constitute a water-purification method in the strict sense of the term, although boiler compounds were still employed extensively, especially in the smaller works.

The Physical Chemistry of Interfaces

Presidential Address by Professor F. G. Donnan, C.B.E., F.R.S.

We give below an abstract of Professor Donnan's Presidential Address, which was read before the Chemistry Section of the British Association at Liverpool on Friday.

In recent years a great deal of attention has been paid by chemists, physicists and physiologists to the phenomena which occur at the surfaces or interfaces which separate different sorts of matter in bulk. During the last quarter of the nineteenth century, both J. Willard Gibbs and J. J. Thomson had shown clearly, though in different ways, the peculiar nature of these interfacial or transitional layers. It was evident that things could happen in these regions which did not occur in the more homogeneous and uniform regions well inside the volume of matter in bulk. Such happenings might, if they could be investigated, reveal molecular or atomic peculiarities which would be undetectable in the jostling throng of individuals inside. A surface or surface layer represents a sort of thin cross section which can be probed and examined much more readily than any part of the inside bulk. It is indeed only within comparatively recent years that the X-rays have provided a sufficiently fine probe for examining this bulk in the case of crystalline matter.



PROFESSOR F. G. DONNAN

The natural inference from results such as those of B. Hardy on surface tension is that the cohesional forces between the molecules are essentially chemical in origin and that they depend in large measure on the presence of "active" atoms or groups of atoms, namely those possessing strong fields of "residual chemical affinity"; in other words, powerful and highly localised stray fields of electrical or electromagnetic force (or of both types). The existence of such atoms or atomic groups is strong presumptive evidence of the unsymmetrical fields of force postulated by Hardy and therefore of the molecular orientation at surfaces.

The conclusions drawn by Hardy have been amply confirmed by W. D. Harkins and his collaborators, who in a long series of accurate measurements of surface and interfacial tensions have found that in the case of very many organic liquids the "adhesional work" towards water is greatly increased by the presence of oxygen atoms (as in alcohols, acids, and aldehydes). They find that the very symmetrical halogen derivatives CCl_4 and $C_2H_4Br_2$ (which possess specially high values for their own cohesional work) give markedly low values for their adhesional work towards water, and that in the case of unsymmetrical molecules, the adhesional work towards water is determined by the presence of certain active atoms or atomic groups.

The Effects of Atomic Groups

In his work on static friction and lubrication, Hardy has found that the influence of chemical constitution and the effects of active atomic groups are very pronounced. This, comparing aliphatic or open chain compounds, the co-efficient of static friction falls (and the lubricating power increases) as we pass through the series hydrocarbon—alcohol—acid. The corresponding ester is in this case a much worse lubricant than the related acid or alcohol. These results suggest, as Hardy has indicated, that friction is caused by the molecular cohesion of surfaces, and that in the action of such lubricants the molecules are oriented with their long axes normal to the surface, whereby the active atomic groups play an important part in "taking up" or saturating a portion of the stray force-fields of the molecules of the solid surfaces, and in orienting and anchoring the lubricant molecules to these surfaces. Many facts lend strong support to Hardy's views.

This question of the orientation of molecules at the surfaces of liquids has been greatly extended in recent years by a detailed study of the extremely thin and invisible films formed by the primary spreading of oily substances on the surface of water. In a continuation and development of the work of Miss Pockels, the late Lord Rayleigh showed many years ago that when olive oil forms one of these invisible films on water, there is no fall in surface tension until the surface concentration reaches a certain very small value. He made the highly interesting and important suggestion that this concentration marks the point where there is formed a continuous layer just one molecule thick. In the case of olive oil, he found this critical thickness to be 10^{-7} cm., and concluded that this number represented the order of magnitude of the diameter of a molecule of the oil. Increase in surface concentration beyond this point causes the surface tension to fall until a second point is reached, after which no further fall in surface tension occurs. H. Devaux and A. Marcelin showed that the fall in surface tension must be ascribed to the closer packing of the molecules of the unimolecular layer, and that the second point occurs when these molecules are packed as tightly as possible.

Unimolecular Layers

The results of Langmuir agree in a wonderful manner both with the idea of a unimolecular layer and with that of molecular orientation. We perceive here the first actual experimental proof of the theory of molecular orientation. Another fact of great significance emerges from these results. If we calculate the average distance between two adjacent carbon atoms in the three acids, we obtain a value of $1{\cdot}4 \times 10^{-8}$ cm. Now this distance must be of the order of magnitude of the distance between the centres of the carbon atoms in the crystal structure of a diamond. This latter distance is known to be $1{\cdot}52 \times 10^{-8}$ cm. The agreement is striking. Although the results of N. K. Adam must be considered as more accurate and detailed than those of Langmuir, they provide an ample confirmation of the theory of unimolecular films of juxtaposed and oriented molecules. If we calculate the average distance between two carbon atoms for the four acids, we again obtain values that do not deviate much from the value for the distance between the carbon atom centres in the diamond ($1{\cdot}52 \times 10^{-8}$ cm.) Too much stress cannot, however, be laid on this point, since in calculating the lengths of the oriented carbon chains an assumption has to be made regarding the density of the film, because only its area and mass are given directly by experiment.

Concerning this point some very interesting results have been recently obtained in Sir William Bragg's laboratory by Dr. A. Müller. In these experiments layers of crystallised fatty acids on glass plates have been examined by an X-ray photographic method. Comparing the result with the value

for the distance between the carbon centres in the diamond lattice, it would appear that the carbon atoms in the long hydrocarbon chains of the higher saturated fatty acids are arranged in a zig-zag, or more probably in a spiral or helix.

Surface Absorption

As pointed out by Langmuir, the question of the formation of unimolecular surface films can be attacked in a different manner. It is known that gases or vapours can be condensed or adsorbed by solid and liquid surfaces. The question then arises, does the formation of primary unimolecular films ever occur in such cases? Langmuir has measured the adsorption of a number of gases at low temperatures and pressures on measured surfaces of mica and glass, and has arrived at the conclusion that the maximum quantities adsorbed are always somewhat less than the amounts to be expected in unimolecular surface layer. E. K. Carver, who has measured the adsorption of toluene vapour on known glass surfaces, has arrived at a similar conclusion. The view that the *maximum* adsorption from the gas phase cannot exceed a unimolecular layer has, however, been much criticised. Thus, for example, M. E. Evans and H. J. George, on the basis of their own measurements on the adsorption of gases on a known surface of glass wool, combined with the data obtained by Mülfarth, have concluded that the adsorption layer may be several (and in some cases many) molecules thick.

Let us now consider another type of formation of surface layers at the surfaces of liquids—namely, the case where a substance dissolved in a liquid concentrates preferentially at the liquid-air or liquid-vapour interface. Gibbs and, later, J. J. Thomson have shown that if a dissolved substance (in relatively dilute solution) lowers the surface tension, it will concentrate at the surface. That such a phenomenon actually occurs has been qualitatively demonstrated in the experiments of D. H. Hall, J. von Zawidski, F. B. Kenrick and C. Benson, by the analysis of foams and froths. If we consider the various experimental values, it will be at once evident that they are not very different from the values found by Langmuir and by Adam for the oriented unimolecular layers of practically insoluble fatty acids resting on the surface of water. That in the present case some of the values are larger might easily be explained on the ground that these adsorption layers are partially, or completely, in the state of "surface vapours." For Adam and Marcelin have recently made the important discovery that the unimolecular surface films investigated by them may pass rapidly on increase of temperature from the state of "solid" or "liquid" surface films to the state of "vaporised" surface films, in which the juxtaposed molecules become detached from each other and move about with a Brownian or quasi-molecular motion, probably communicated to them by the thermal agitation of the water molecules to which they are attached.

Another interesting phenomenon relating to the surfaces of liquids and solutions is the existence of an electrical potential gradient or potential difference in the surface layer. These interfacial potential differences are of great importance, and play a fundamental rôle in determining the stability or instability of many colloidal states of matter. The liquid-gas interface offers the simplest case of such interfaces, and so the investigation of the potential differences which may exist at this interface is a matter of fundamental interest.

Emulsions and Foams

The subjects which I have been discussing have an interesting bearing on the formation and stability of foams and froths. If air be violently churned up with water, only comparatively large bubbles are produced, and these quickly rise to the surface and burst. If now a very small quantity of a substance which concentrates at the air-water interface be added, an almost milk-white "air emulsion" of small bubbles is produced, which rise to the surface and produce a relatively durable froth. These phenomena were discussed by the late Lord Rayleigh in a very interesting Royal Institution lecture on "Foam." It is clear that the diminution in interfacial tension facilitates the subdivision or dispersal of the air. The existence of the surface layer will also confer a certain amount of stability on the resultant froth, since it will give rise to forces which resist the thinning of a bubble wall. Any sudden increase in the surface will produce a momentary diminution in the concentration or "thickness" of the surface layer, and hence a rise in surface tension, which will persist until the normal thickness or concentration is readjusted by diffusion of molecules from the inside volume—a process which in very dilute solution will occupy a perceptible time. That this explanation (due to the late Lord Rayleigh) is the correct one can be seen from the fact that very often stronger solutions of the same surface-active substance scarcely foam at all. In this case the readjustment of the equilibrium thickness or concentration of the surface layer occurs with such rapidity (owing to the greater concentration of the molecules in the inside volume) that practically no rise in surface tension, and hence no counteracting force, comes into play. These effects will be the more pronounced—other things being equal—the greater the mass and hence the smaller the motion of the solute units, as in the case of large molecules or colloidal micelles. It is probable, however, that the explanation of the stability of very durable forms, as, for example, those produced by the sea at the sea coast, by beer and stout, by aqueous solutions of soap or saponin, etc., is often more complex, and that we must seek it in the formation of very viscous or semi-rigid or gel-like membrances at the interface. Moreover, small solid particles may contribute to the stabilisation of a froth, as in the case of the "mineralised froths" of the ore flotation process; and the preferential aggregation of small particles in the interface between two phases has been demonstrated in the experiments of W. Reinders, F. B. Hofmann, and many others.

Immiscible Liquids and Electric Phenomena

Let us now inquire how far the phenomena which we have seen to be characteristic of a gas-liquid interface occur also at the interface between two immiscible or partially miscible liquids. Many years ago it was shown by Gad and Quincke that a fatty oil (such as olive oil) is very readily dispersed in the form of an emulsion by a dilute solution of caustic soda. Some experiments which I once made showed that a neutral hydrocarbon oil could be similarly emulsified in a dilute aqueous solution of alkali if one of the higher fatty acids was dissolved in it, whilst the lower fatty acids do not produce a similar action. It was shown that the action runs parallel to the lowering of interfacial tension, and must be ascribed to the formation of a soap, which lowers the interfacial tension and concentrates at the interface.

It has been shown that in the case of an air-water surface there exists an electrical separation or potential difference in the surface layer, and that certain substances can produce pronounced variations, or even reversals in sign, of this electrical double layer. It becomes a matter, therefore, of great interest to inquire whether similar phenomena occur at the interface between two immiscible liquids, and, if so, to ascertain whether such electrical charges or double layers bear any relation to the "stability" of pure emulsions, or fine dispersions of one liquid in another. It is well known that those disperse or finely heterogeneous states of matter known as colloidal solutions depend in part for their stability on the existence of such electrical potential differences. We might expect, therefore, that an investigation of these emulsion systems would throw some light on the general theory of what are called "suspensoid" or "lyophobic" colloidal states. Investigations with these objects in view were carried out some years ago in my laboratory by R. Ellis and F. Powis.

The experiments brought out the very important fact that when the interfacial P.D. (whether positive or negative) is above a certain value, which was about 0·03 volt for his conditions, the rate of coagulation or coherence of the oil drops is relatively small, but rapidly increases when the P.D. falls inside the zone −0·03 to +0·03 volt. Under definite conditions there exist, therefore, what we may, speaking broadly, call a *critical potential* and a *critical potential zone*. When the P.D. is outside this zone the emulsion is comparatively very "stable." Very small concentrations of electrolytes, which, as we have seen, increase the P.D., increase this stability. As soon as the concentration of any electrolyte is sufficient to bring the P.D. into the critical zone, the stability of the emulsion undergoes a sudden and very marked decrease, and relatively rapid coagulation occurs.

These studies of oil emulsions (and of the glass-water interface), by means of the micro-cataphoresis method, have thrown a great deal of light on many previously ill-understood points

in the theory of colloids. If, for example, the P.D. between the particles of a suspensoid hydrosol and the aqueous fluid are not above the critical potential, coagulation will occur. But very small concentrations of certain electrolytes can raise the P.D. and stabilise the hydrosol. This is the explanation of the well-known "peptising" action. Higher concentrations of even the same electrolytes will reduce the P.D. below the critical potential, and produce flocculation. We see also that rapid coagulation will occur before the P.D. becomes zero. This was proved for arsenic sulphide hydrosol by Powis. Later experiments of Kruyt have confirmed these conclusions. It is obvious, therefore, that coagulation of a lyophobic hydrosol will occur before the iso-electric point is reached, and that Hardy's famous rule requires revision.

The Stability of Oil Emulsions

In discussing the "stabilities" of hydrocarbon oil emulsions, it must not be forgotten that I was dealing with very dilute *suspensions* of oil in water, produced by mechanical agitation without the addition of any "emulsifier." I pointed out that in the emulsification of oils in water by means of soap, the soap lowers the interfacial tension and concentrates at the interface. When we wish to produce oil emulsions in the ordinary sense of the term we must use some such emulsifying agent, and for this purpose many substances are employed, such as soap, gum acacia, gelatine, casein, starch, etc., etc. All these substances concentrate or condense on the surfaces of the oil globules. If we may regard these surface films as very mobile from the molecular-kinetic point of view, it is clear that they will confer an increased degree of stability on the emulsion. For any sudden decrease of interface (caused for example, by coalescence or partial coalescence of two adjacent globules) will produce a momentary increase in the surface concentration or thickness of the adsorption layer, and so a decrease in the interfacial tension, if the surface layer is not saturated. It may require a perceptible time for the molecular-kinetic motion (especially in the case of large molecules or hydrated micelles) to readjust the equilibrium between the surface layer and the bulk.

It is probable, however, that the stability of the emulsion is in many cases due to the fact that the surface films possess a very viscous, quasi-rigid, or gel-like character, so that a more mechanical explanation is necessary. As S. U. Pickering showed, oils may be emulsified in water by the gels of certain basic salts; and A. U. M. Schlaepfer has shown that emulsions of water in kerosene oil may be obtained by means of finely divided "carbon." Nevertheless, even in cases where an emulsifier is used, we may hope to succeed in obtaining a more precise physical analysis of the system. It is interesting in this connection to note that Mr. W. Pohl has recently found in my laboratory that when a neutral hydrocarbon oil is emulsified in water by means of sodium oleate, the electrical potential difference at the oil-water interface is almost doubled, and that the effects of alkalies and salts on this potential difference are very similar to those found in the case where no emulsifier is employed.

I cannot conclude this account of certain aspects of surface actions and properties without making a passing, though all too brief, reference to the beautiful investigations of Sir George Beilby on the amorphous layer. He has shown that when the surface of crystalline matter is subjected to shearing stress there is produced a surface layer of a vitreous or amorphous character—a "flowed" surface—in which the particular ordered arrangement of the molecules or atoms which is characteristic of the crystalline matter largely disappears.

This discussion, necessarily brief and limited, of certain aspects of the properties of surfaces—molecular orientation, surface concentration or adsorption, electrical or ionic polarisation—has dealt very largely with states of thermodynamic equilibrium. The chief interest of such studies has always appeared to me to lie in their possible ultimate bearing on the phenomena of life. We must remember, however, that the activities, and indeed the very existence, of a living organism depend on its continuous utilisation of an environment that is not in thermodynamic equilibrium. A living organism is a consumer and transformer of external free energy, and environmental equilibrium means non-activity, and eventual death.

The Electrical Structure of Matter

Presidential Address by Sir Ernest Rutherford

At the opening of the annual meeting of the British Association for the Advancement of Science at Liverpool on Wednesday, in the course of his presidential address on "The Electrical Structure of Matter," Professor Sir Ernest Rutherford said that the Association had last met in Liverpool in 1896, under the presidency of the late Lord Lister, and that occasion had also been his own first visit to one of the meetings.

That year practically marked the beginning of what had been aptly termed the "heroic age" in Physical Science. The discovery of X-rays by Röntgen had been announced in 1895, while the discovery of the radioactivity of uranium by Becquerel was announced early in 1896. Though the effects of these discoveries could not have been predicted at the time, Professor J. J. Thomson, in his address to the Association, had dealt with the nature of X-rays and the remarkable properties induced in gases by their passage through them. In applied physics, too, this year marked the beginning of a new advance, with the discovery of the properties of electric waves, which had since been applied in wireless telegraphy and telephony.

Professor Rutherford then proceeded to outline the principal discoveries in Physics which have been made since that time, particularly with regard to our knowledge of atomic structure. The discovery of the independent existence of the electron in 1897 was a fact of extraordinary importance in clearing up the somewhat vague ideas then current with regard to the relationship between various atoms as shown in the periodic table of Mendeléef. The study of radioactivity, the identification of alpha particles with the helium atom, the study of X-ray spectra by Moseley, had all contributed to the revolution in our views of the nature of the atom. The first definite attack on the problem of the electronic structure of the atom was made by Professor Niels Bohr, who had applied the newly developed theory of quanta and cleared up many fundamental difficulties.

In order to try to visualise the conception of the atom we have so far reached, Professor Rutherford took for illustration the heaviest atom, uranium. At the centre of the atom was a minute nucleus surrounded by a swirling group of 92 electrons, all in motion in definite orbits, and occupying, but by no means filling, a volume very large compared with that of the nucleus. Some of the electrons described nearly circular orbits round the nucleus; others, orbits of a more elliptical shape whose axes rotated rapidly round the nucleus.

It was possibly too soon to express an opinion on the accuracy of theories defining the outer structure of the atom, but the theory of Bohr, like all living theories, had not only correlated a multitude of isolated facts known about the atom, but had shown its power to predict new relations which could be verified by experiment, for example, certain facts with regard to spark spectra and the existence of missing elements.

The problem of the nature of the nucleus of the atom was much more difficult than that of the outer structure. The mass of the nucleus was the greater part of the atom, but its actual size was minute compared with that of the whole atom. The existence of isotopes indicated that nuclei might have different masses but similar charges, the charge determining the properties of the atom and the nature of the outer structure. The evidence obtained by Aston as to isotopes corresponding to whole numbers showed that the nucleus was built up of units of mass very nearly one. These were called protons or hydrogen nuclei, there being one in a hydrogen atom.

With regard to the artificial disintegration of the more complex atoms, it was by no means so certain to-day as a decade ago that the atom of an element contained hidden stores of energy. The reason for the change of view was that the arrangement of electrons in the normal atom was essentially stable, and that, though it might be artificially disturbed by electronic bombardment, it would afterwards revert to its original state. The radioactive elements were exceptional in that their structure was not stable, and they were changing to a stable state with the evolution of energy. In some cases energy probably would be necessary to disintegrate an atom, but our knowledge in this direction was as yet too uncertain and speculative to give any decided opinion on future possibilities.

The Machinery Exhibition

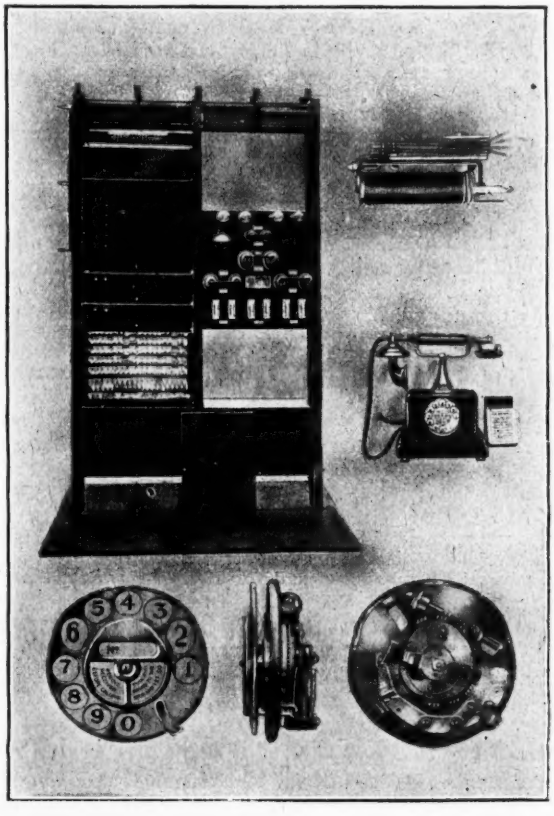
Further Notes on the Exhibits

W. and T. Avery, Ltd., Soho Foundry, Birmingham, and 99, Farringdon Road, London, E.C.1.—Testing and balancing machines are shown on Stand 14, F, including the visible platform weighing machine, the "Universal" testing machine, the indiarubber tester, a 3-ton spring tester, a balancing machine for crankshafts, and a hardness tester. The practical application of all these apparatus is described. The machine for testing the physical properties of rubber is automatic in operation. The load is applied by connecting up the machine to the district low water pressure supply, and is indicated by a weighted pendulum arm, traversing graduations reading from zero up to 50 kgs. by subdivisions of 0·1 kgs. These readings are increased to 100 kgs. and 0·2 kgs. respectively by the application of a weight to the pendulum. An autographic recorder gives the mechanical hysteresis of the material. The "Universal" testing machine is designed on the single lever principle, and the load is indicated by a poise weight traversing a graduated scale on the steelyard, which is graduated from zero to 50 tons, the finest subdivision being 0·1 ton.

Jeyes' Sanitary Compounds Co., Ltd., 64, Cannon Street, London, E.C.4.—The specialities shown on Stand 4 in the gallery, representing the well-known company bearing its name, are of general knowledge because they are in common use. The animals' wash, "Jeyes' Fluid," is in alignment with "Cyllin," a disinfectant, said to be from twenty to eighty times more effective as a germicide than pure carbolic acid—according to the organism against which it is employed—and ten times less caustic and toxic. "Cyllin," tested against glanders, proved to be from eighteen to twenty times more powerful than pure carbolic acid. Sheep dip, "Lysol," sanitary powder (three times the strength of 15 per cent. carbolic powder), disinfectant sawdust for kennels and farm buildings, veterinary warble and footrot ointments, stable and kennel soap; "Lano Cyllin" for burns and chilblains, and horticultural washes and sprayers, complete an interesting group.

The Stream Line Filter (Hele-Shaw System), 64, Victoria Street, London, S.W.1.—The stand of this firm (9 F) has attracted considerable attention owing to the demonstrations which are given of the new stream line filter. This device, which works by passing the liquid under pressure between sheets of impervious paper is shown in two sizes, laboratory and industrial. Both sizes are shown, filtering liquids such as waste oil, gas works liquor, dye solutions, muddy water, etc. The industrial filter is adaptable to a very wide range of uses, and may be built up to very large capacities, a model being shown of one designed to filter 10,000 gallons per hour. In addition, the means of cleaning the filter while working is on view. We understand that the orders booked for various types of these filters have been so heavy that delivery of further orders can now not be given for at least six weeks.

The Relay Automatic Telephone Co., Ltd., Marconi House, Strand, London, W.C.2.—The illustration given on this page shows some details of the telephones and switchboard exhibited by the above firm on Stand 20, C, and described in our issue last week (p. 256).



Metallisation, Ltd., 1, Albemarle Street, London, W.1.—The demonstrations on this company's stand (No. 8, K) consist in the melting and atomising of the coating metal, or alloy, which is in wire form, and impinging it as a fine spray on the surface to be coated. The work may be done in the shop or in the open air. A spraying pistol, weighing less than 3½ lb., is connected to gas and air supplies—gas for providing combustion, and air for providing the motive power of the automatic feeding device. Oxy-hydrogen, oxygen-acetylene or oxygen-town's gas may be used under suitable pressures. Automatically the metal is drawn from a reel into the pistol case, and fed according to its melting rate into the nozzle, where, entering a continuous flame zone, it is melted and blown at a very high velocity in the form of a fine spray or mist on to the work to be coated.

Other Exhibits

In addition to the important displays to which reference has been made the following are worthy of notice: Boulton and Paul, Ltd., Riverside Works, Norwich; The British Engine, Boiler and Electrical Insurance Co., Ltd., Fennel Street, Manchester; E. Arnold Pochin and Brothers, engineers, Trafford Park, Manchester; Siemens Bros. and Co., Ltd., Caxton House, Westminster, S.W.1; Sparklets, Ltd., Prana Works, Edmonton, N.; Thorn and Hoddle, Ltd., oxy-acetylene welding and metal cutting apparatus manufacturers, 151, Victoria Street, London, S.W.1; The Vono Co., vices makers, of Dudley Port, Staffs; and The Gledhill-Brook Time Recorders, Ltd., Empire Works, Huddersfield. The latter firm are exhibiting on Stand 19, J, a complete range of time recorders and job costing systems which are very simple in practice, giving costings with the utmost accuracy. The firm have two new models of portable time recorders on public view for the first time.

From Week to Week

TROUBLE with the chemical workers at Camelon, Scotland, has arisen on account of a notice given to reduce wages.

"APPLIED CHEMISTRY IN MODERN LIFE" is the title of an address by Mr. W. J. U. Woolcock which will be broadcast from London on September 19.

COAL PRICES generally in London were raised on Monday by a shilling a ton, and the price of anthracite stove nuts was increased by four shillings.

MR. HENRY EVERY, a member of the firm of Henry Every and Co., chemical colour merchants, of 183, Rutherglen Road, Glasgow, died recently at his residence, St. Andrew's Lodge, Uddingston.

MR. JAMES M. BROWN, of 35, Surrey Street, Strand, London, W.C.2, has been appointed sole distributor of the products of Keeling's Oxides (1921) Ltd., Stoke-on-Trent, and in future all orders and communications should be addressed to him.

AT STROMNESS, on the Orkney mainland, has been constructed a large factory and power house for the utilisation of seaweed in the manufacture of briquettes and patent fuels, the extraction of chemicals and the production of a new kind of feeding stuff.

THE SOCIÉTÉ ANONYME DE COULEURS D'ANILINE AND PRODUITS CHIMIQUES "SACA," 60, Rue de Mérode, Brussels, have been appointed by the Belgian Government sole distributors of the aniline dyes seized in the German factories as reparation goods.

IN CONNECTION with the British Empire Exhibition of 1924, Mr. W. J. U. Woolcock has been appointed a member of the Royal Society committee, and Sir Herbert Jackson, F.R.S., a member of the science committee of the Association of British Chemical Manufacturers.

IN A PAPER on "Preservatives and other things in food," read at the Sanitary Inspectors' Association at Rhyl last week, Mr. W. G. Kershaw urged that the use of chemical colouring matter and agents in food should be totally prohibited. Other speakers suggested limitation of the use of preservatives as preferable to prohibition.

SIX MEN were killed at the Middlesbrough steel works of Dorman, Long and Co., Ltd., on Saturday, September 8. A wire rope attachment, by which a ladle containing molten slag and metal was suspended, broke, and in addition to those killed, other workmen were injured by being splashed with molten metal.

A LECTURE entitled "The Scientific Point of View," was broadcast from the London station of the British Broadcasting Co. on Friday, September 7, by Professor Myers, Wykeham Professor of Ancient History at Oxford and Senior General Secretary of the British Association for the Advancement of Science.

THE WESTERN GALLERIES of the Science Museum, South Kensington, will be closed to the public on Monday for the purpose of transferring certain of the collections, including those illustrating chemistry, physics, mining, and metallurgy, to the new buildings of the Science Museum. These collections will be placed on exhibition as soon as galleries are available for their reception.

A MEETING of members of the Mansion House Association on Railway and Canal Traffic took place at the association's offices on Friday, September 7, when the schedules of standard rates submitted by the railway companies to the Rates Tribunal were considered at length. The association will give every assistance to its members in lodging the necessary objections to the railway companies' proposals.

WITH RESPECT to the paragraph which appeared in last week's issue of THE CHEMICAL AGE on the American device for use with bleaching processes, in which sulphur is burned in an open pan, we understand that Chance and Hunt, Ltd., 61–62, Gracechurch Street, London, have a supply of pamphlets illustrative of this method of burning brimstone, a copy of which they will be pleased to forward to anyone interested.

SIR GLYN WEST, president of the Sir W. G. Armstrong-Whitworth Co., was a visitor to Montreal last month on his way to Newfoundland in connection with the large pulp and paper plant being constructed there by the company. He also went to Canada in relation to the plant for making paper machinery at Longueuil, acquired by Charles Walmsley and Co. (Canada), Ltd., which is controlled by the Sir W. G. Armstrong-Whitworth Co.

THE PRESIDENTIAL ADDRESS by Sir Ernest Rutherford before the British Association on Wednesday was delivered in the Philharmonic Hall, Liverpool, and was not only transmitted by telephony to a loud-speaker in the lecture hall of the Association Exhibition, but to all the broadcasting stations in the country, and sent out simultaneously. In view of the great publicity thus given the President broke away from tradition by giving a résumé of the address instead of reading the printed text.

THE DISCOVERY of a synthetic substitute for insulin is reported and is being tested by a west-end physician in the treatment of diabetes. The discoverer is Mr. Oliver A. Newell, a bio-chemist, who has named his product "diabetine," and states that it can be produced in large quantities if necessary. It is chemically of the same composition as insulin, but is produced synthetically, but unlike insulin it may be administered by the mouth instead of by injection. The tests of this substance will be watched with interest.

MR. GEORGE ALEXANDER LOCKETT, the head of the firm of William and John Lockett, South American merchants, and of Lockett Brothers and Co., who died in London on Monday at the age of 68, was well known in connection with the nitrate industry. With Colonel J. T. North (known as the "Nitrate King") and Sir Robert Harvey (the present chairman of the Liverpool Nitrate Co.), he took a prominent part in the development of the nitrate industry. He had many times visited the nitrate fields of South America, and he was a director of the Liverpool Nitrate Co., the Lagunas Syndicate and the Tarapaca Waterworks Co.

DR. R. S. MORRELL (chief chemist to Mander Bros.) in a lecture at the luncheon of the Wolverhampton Rotary Club on "Paints and varnishes in the World's Work" last week, pointed out that the paint and varnish industry played an important part in the protection of all inanimate materials. For the interior of private dwellings, the protective object seemed at first sight to be subservient to decorative effect, while for the exterior of buildings the protective function was predominant. Nevertheless, the latter must also combine something of the decorative, and it was the combination of this with the useful which was indicative of progress.

DR. ALFRED RÉE, a member of the Executive Committee and vice-chairman of the Chemical and Allied Trades Section of the Chamber, has been elected vice-president of the Manchester Chamber of Commerce in succession to Sir Edward Rhodes, who has resigned. Dr. Rée was for many years a prominent chemical manufacturer in the Manchester district and is associated with the Association of British Chemical Manufacturers. He will be remembered by chemists all over the country as one of the pioneers of the movement which aimed at the organisation of professional chemists and which a few years ago led to the formation of the British Association of Chemists. For a time Dr. Rée took a leading part in the life of the B.A.C., though he severed his connection with that body when it was definitely decided to secure registration of the Association as a trade union.

THE NEW METALLURGICAL LABORATORIES of the Manchester University were opened on Tuesday by Sir George T. Beilby before a large gathering. The formal proceedings were brief; guests were received in the Whitworth Hall by Sir Henry Miers, Vice-Chancellor of the University, and after the ceremony was ended they went to inspect the new wing, where the work of the department was demonstrated. Sir Henry Miers presided and welcomed the guests, and in particular the members of the Institute of Metals. Sir George Beilby, in a brief address, spoke of the work of pioneers, showing how experiment and observation lay at the roots of progress, and referred to the new laboratory as the "visible expression of the latest thought and practice in the production and manipulation of metals." Mr. J. Phillips Bedson, after outlining the history of Henry Cort, the inventor, announced that Major Ernest Johnson, on behalf of his firm, had given a medal, to be known as the Cort Medal, for the department.

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Abstracts of Complete Specifications

201,968. Intimate Mixtures of Substances, Processes for Producing, and for Obtaining Chemical Products therefrom. J. W. Spensley, and the Chemical Engineering Co. (Manchester), Ltd., 49, Deansgate, Manchester. Application dates, April 4, September 14 and October 31, 1922.

It has been found that some reactions which usually only take place by the use of long-continued heating or agitation, or both, may be effected in a very short time if the mixture is passed through a high-speed centrifugal mill having intercalating pins mounted on horizontal discs. The mixture is introduced continuously at the centre and discharged all round the circumference. In some cases the reaction may not be completed in the mill, but is completed when the intimate mixture is allowed to stand. The mill described in Specification No. 186,462 (see The Chemical Age, Vol. VII., p. 651), which has a circumferential speed of about 20,000 ft. per minute, is preferably used.

In an example, the process may be applied to the manufacture of ordinary hard soap. A mixture of cocoanut oil 4 parts and stearine 6 parts is melted at about 82° C. and is run into the mill together with a solution of caustic soda 1·5 parts in water 11 parts. The product is passed twice through the mill, and is then ready for solidifying into soap. A single mill having a rotating disc about 26 in. diameter has a capacity of about 1 ton of soap per hour. Soft soap, consisting of vegetable or animal oil and caustic potash may be made in a similar manner. In making dry soap-powder, which usually consists of soda ash added to ordinary soap, the ingredients of the soap and the soda ash may be passed simultaneously into the mill, yielding a finely-disintegrated soap-powder which is non-hygroscopic. In producing edible oils, the fatty acids contained in them are usually saponified with caustic soda, which also saponifies some of the neutral fat. In the present invention soda-ash is used, and the fatty acids are completely saponified, leaving the neutral fats unattacked. Solid and semi-solid lubricants may be produced in the mill by treating an animal or vegetable fat with lime or caustic soda to neutralise it, and mixing the saponified product with a mineral oil. It is found that the neutralising reaction in the mill is more complete and instantaneous if 2–7 per cent. of water is present. The mill may also be used for the manufacture of caustic soda by passing milk of lime and a milk of soda-ash and water through it, yielding a product which is passed through a filter-press or hydro-extractor to obtain a 20 per cent. solution of caustic soda. Another example is given of the production of an accelerator for the vulcanisation of india-rubber. A mixture of zinc oxide 31 parts or china clay 6 parts, piperidine 1·5 parts, and carbon bisulphide 1·5 parts, is passed simultaneously through the mill. The mill may be used for producing a vulcanising preparation by passing china clay through it in contact with sulphur dioxide and hydrogen sulphide. The two gases react, yielding sulphur, which impregnates the china clay. Reference is directed in pursuance of Section 8, Sub-section 2 of the Patents and Designs Acts, 1907 and 1919, to Specification No. 186,462.

201,986. Mineral Oil, Refining of. P. T. Sharples, Merion, Montgomery Co., Pa., U.S.A. Application date, May 1, 1922.

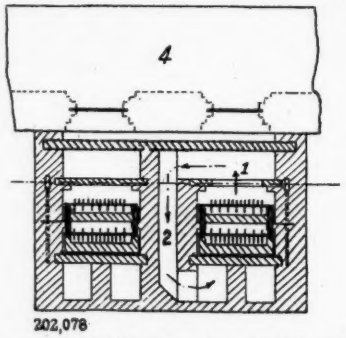
The object is to remove wax from lubricating distillates without the cracking distillation which is usually employed to effect "crystallisation" of the wax. Such cracking reduced the viscosity and yield of the lubricating oil. In the present invention, the residue obtained by distilling off without cracking the lower boiling point constituents from crude petroleum is distilled by heat and steam, which removes first the light lubricating oils containing the "crystalline" wax. This wax may be removed by cooling and filter pressing. The next distillation contains wax in an intermediate condition between the "amorphous" and "crystalline" wax. The distillate is diluted with a lighter solvent such as naphtha to reduce the density of the oil relatively to the wax, and the mixture is cooled to precipitate the wax, and then centrifuged to separate the wax. It is usually necessary to use about 70 per cent. of naphtha, and to cool the mixture to about 0°–10° F. The cooling of the diluted oil is effected by means of cooling surfaces, from which the deposited wax is continuously removed by scraping. The separation is effected in a centrifuge containing a carrier liquid, preferably water. It is found that the water does not freeze owing to the air friction on the bowl of the centrifuge. Reference is directed in pursuance of Section 7, Sub-section 4 of the Patents and Designs Acts, 1907 and 1919, to Specification No. 166,031.

202,016. Wood or the Like, Treatment of—to Obtain Lignone in New Derivative Forms. C. F. Cross, 3 and 4, New Court, Lincoln's Inn, London, W.C., and A. Engelstad, Vardal, Norway. Application date, May 8, 1922.

Wood or lignified material is dissolved into pulp and soluble derivatives of the lignone complex by digesting it with a strong aqueous solution of sulphurous acid which is substantially free from sulphuric acid. The digestion is carried on at 100°–110° C., and sulphuric acid is formed as the digestion proceeds, but is without blackening effect on the wood. The sulphurous acid used may be obtained by washing sulphur-burning gases before they are dissolved in water, or by precipitating the sulphuric acid from ordinary sulphurous acid by adding the equivalent quantity of barium sulphite. The contents of the digester are washed, and the liquor contains the lignone derivatives, which differ from those obtained in waste sulphite cellulose liquor and are superior for tanning purposes. To isolate the derivatives in concentrated form, residual sulphurous acid must be expelled, and any sulphuric acid removed by precipitation as barium sulphate. The filtrate is evaporated at a low temperature and at reduced pressure. The dry product contains the original lignone complex of the wood with a proportion of combined sulphur.

202,078. Furnaces Producing Sulphurous Gases. C. S, Imison, The Cottage, Runcorn, Cheshire, J. A. Bligh. The Elms, Rainhill, Lancs., R. R. Wright, 46, Lockett Road, Farnworth-in-Widnes, Lancs., and John F. Carmichael and Co., Ltd., 729, Tower Building, Water Street, Liverpool. Application date, May 22, 1922.

In a furnace for producing sulphurous gases, the central outlet 1 communicates with the down-take flue 2 adjacent to the side of the furnace, so that the gases are kept hot while



202,078

in this flue. The gases then pass to a longitudinal horizontal flue below the furnace hearth to the further end, and then back through a parallel horizontal flue under the furnace hearth. The gas then passes upwards through a vertical flue in the side wall of the furnace, and then to an outlet 4. Means of access to these flues may be provided at the junctions of the various sections. It is found that dust is deposited and the gases purified without cooling when passing through these flues.

202,024. Purification of Gases from Hydrogen Cyanide. J. G. Taplay, 45, Sternhold Avenue, Streatham Hill, London, S.W.2, and W. L. Galbraith, 84, Horseferry Road, Westminster, London. Application date, May 9, 1922.

It is found that if hydrogen cyanide is brought into contact

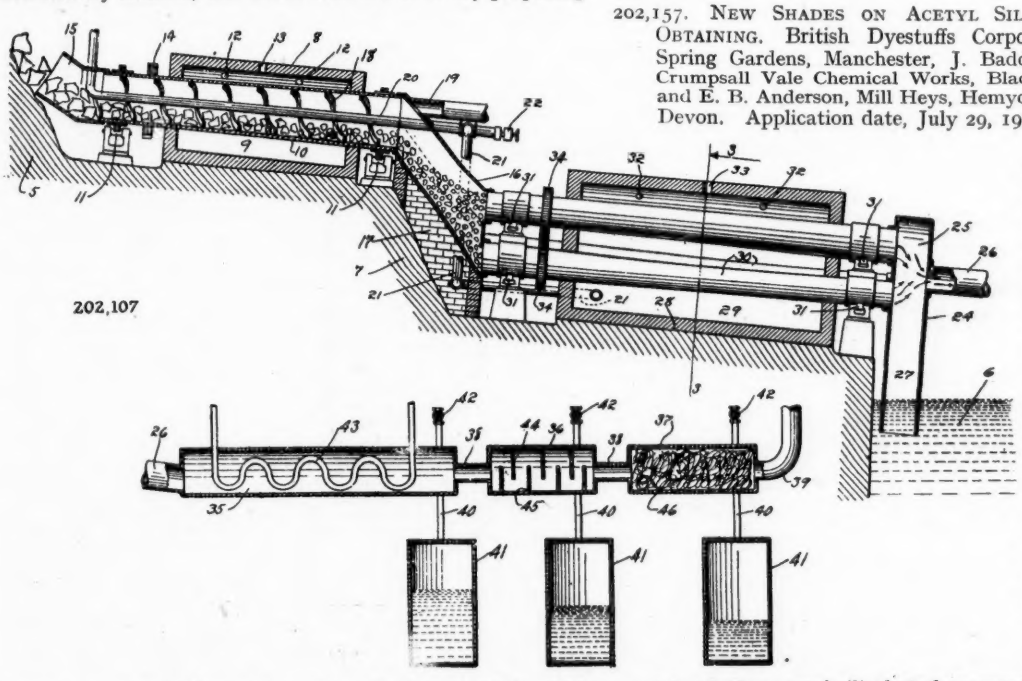
[*Continued on page* 289]

[*Continued from page* 288]

with ammonia and sulphuretted hydrogen in the presence of an alakine earth bi-carbonate, the hydrogen cyanide is decomposed and converted into ammonium thiocyanate, the reaction being a cyclic one. In the reaction, the bicarbonate is converted into the normal carbonate, so that if carbon dioxide and water are also present, the bi-carbonate is produced again. The bi-carbonate may be produced *in situ* by bringing the reacting gases containing carbon dioxide into contact with the carbonate of an alkaline earth in the presence of water. A suitable carbonate is chalk, but hard varieties of calcium carbonate are not suitable. Alternatively, the aqueous solution of calcium bi-carbonate may be prepared by passing carbon dioxide or waste flue gases through a mixture of chalk and water. The surface of the carbonate must be maintained clean during the reaction by washing with water or weak ammoniacal liquor, but not sufficiently to wash out the bi-carbonate. The process may be applied to the purification of industrial gases such as crude coal-gas and coke-oven gas, containing sulphuretted hydrogen, ammonia, carbon dioxide, and hydrogen cyanide. It is necessary to pass the gas first through a tar washer to remove all traces of tar. When the contact agent is employed in solid form, the ammonium thiocyanate is deposited on it and is recovered from the wash water together with ammonium sulphide, ammonium carbonate, and ammonia.

202,107. RETORTING OIL SHALE. H. L. Brown, 426, Ridgewood Avenue, Glen Ridge, N.J., U.S.A. Application date, June 14, 1922.

Oil shale is delivered into a rotary retort 10 arranged in a furnace box 8 and mounted on rollers 11. Burner openings 12 are provided in the combustion chamber 9 for heating the retort, and the vapour is drawn off through the outlet 19. The shale then passes through a downwardly-inclined shoot 16 to the inlet ends of the superheating retorts 20. In passing through retort 10, the shale is subjected to a series of light mechanical shocks to liberate the vapour and gas, and to present fresh surfaces for the distillation. This may be effected by means of a helical device 18 which is this case serves also to convey the shale forward. When the retort is downwardly inclined, this device need not have any propelling



202,107

action. A heating conduit 20 may also be provided, which receives hot gases through the pipe 21 from the combustion chamber of the superheating retorts. A burner 22 may also be provided to furnish additional hot gas. The final heating of the shale is effected in a number of open-ended retorts 30, supported on rollers 31, the combustion chamber 29 being provided with burner openings 32. These retorts discharge into a common passage 27, which is provided with a vapour outlet 26. The vapour passes to a series of condensers 35, 36, 37, each having a pipe 40 which discharges the condensate into a vessel 41. These condensers may be provided with a cooling coil 43, baffles 44, and filling material 46, respectively. The temperature in the retort is regulated to avoid cracking distillation, and superheated steam may be introduced for this purpose.

202,143. FILTERS. H. Bechhold, 26, Niederräderlandstrasse, Frankfurt-on-Main, Germany. Application date, July 17, 1922.

These filters are of diatomaceous earth, cellulose, clay, etc., used for filtering water, fruit juices, serum, etc., or of sand, gravel, coke, or the like used for filtration on a large scale. The object is to treat the filter so as to prevent the passage through it of micro-organisms. The invention consists in impregnating the filtering medium with at least two metals which either belong to the group of metals of lower solution tension than hydrogen and of higher solution tension than platinum, or which comprises one of these metals, the other being of lower solution tension than silver. The latter metal is present in relatively small proportion and acts as an activator. Suitable metals forming the principal ingredients are copper, silver, mercury, bismuth, arsenic, and antimony. The activator may consist of gold. The metals may be replaced by their compounds which are insoluble or only slightly soluble, such as copper oxide, copper ferro-cyanide, copper carbonate, silver oxide, chloride, sulphocyanate, or chromate, mercuric oxide, mercurous chloride, bismuth trioxide and pentoxide, antimony oxide, etc. As an example, copper or copper oxide may be used as the principal ingredient and copper or silver or mercurous chloride as activator. The substances introduced into the filter must be deposited in it uniformly—*e.g.*, from the gaseous state, or from solutions or combinations such as the metallic salts of weak acids which are readily absorbed by the filters. Filters impregnated in this manner are found to be exceptionally efficient for filtering water containing micro-organisms.

202,157. NEW SHADES ON ACETYL SILK, PROCESS FOR OBTAINING. British Dyestuffs Corporation, Ltd., 70, Spring Gardens, Manchester, J. Baddiley and J. Hill, Crumpsall Vale Chemical Works, Blackley, Manchester, and E. B. Anderson, Mill Heys, Hemyock, near Tiverton, Devon. Application date, July 29, 1922.

In dyeing acetyl cellulose it is necessary to render the dyestuffs soluble in water, whilst not rendering them insoluble in organic solvents and consequently without affinity for acetyl cellulose. Dyestuffs which contain carboxylic acid groups are soluble in water and at the same time suitable for dyeing acetyl silk provided that no sulphonic acid groups are present. Some dyestuffs conforming to this definition have already been used for dyeing acetyl silk, but the general rule has not been recognised. The dyes covered are soluble amino azo dyestuffs containing one or more carboxylic acid groups and a diazotisable amino group, so that after dyeing with the carboxylated azoamine dye different shades may be obtained by diazotising

the dyestuff on the fibre and developing in the usual way. Reference is directed in pursuance of Section 7, Sub-section 4 of the Patents and Designs Acts of 1907 and 1919 to Specification No. 182,830.

NOTE.—Abstracts of the following specifications which are now accepted, appeared in THE CHEMICAL AGE when they became open to inspection under the International Convention :—191,064 (Soc. Anon. des Matières Colorantes et Produits Chimique de Saint Denis, A. E. Wahl, and R. Lantz) relating to manufacture of 1-phenylimino-2-naphthoquinone, see Vol. VIII., p. 242 ; 193,802 (Algemeine Ges. für Chemische Industrie) relating to the purification of hydrocarbons, see Vol. VIII., p. 494).

International Specifications not yet Accepted

200,482. CELLULOSE PULP LIQUORS, TREATING. L. J. B. A. Colas and A. P. J. Colas, 78, Avenue de la Grande Armée, and L'Alfa, Soc. Anon pour la Fabrication des Pates de Cellulose, 124, Rue la Boetie, Paris. International Convention date, July 5, 1922.

When vegetable materials are boiled with alkali to produce cellulose pulp, a " black liquor " is obtained, and the object is to recover organic acids and alkali metal compounds from it. The liquor is treated with oxalic or acetic acid, or a salt of these acids to flocculate the coarser impurities, which are then removed. The separated material is treated with oxalic acid to liberate the fatty substances which are dissolved out and recovered by means of alcohol, carbon tetrachloride or trichlorethylene. The original liquor is then treated with lime or magnesia or powdered animal black to absorb most of the remaining impurities. The absorbed matter may be removed by a solvent. The original liquor is then distilled fractionally to recover volatile substances, and may then be calcined with carbon in a furnace to recover soda.

200,508. ORGANIC PEROXIDES. Naamlooze Vennootschap Vereenigde Fabrieken van Chemische Producten, Deventer, Holland. International Convention date, July 4, 1922.

Benzoyl peroxide is disintegrated with water or other liquid such as salt solution, benzol, alcohol, or a mixture of an organic and an inorganic liquid to bring it into a fine state of subdivision for bleaching flour. The grinding may be effected by means of hard porcelain balls in a wooden vessel at or below normal temperature.

200,511. ORGANIC ACID CHLORIDES. Farbwerke vorm. Meister, Lucius und Brüning, Hoechst-on-Main, Germany. International Convention date, July 6, 1922.

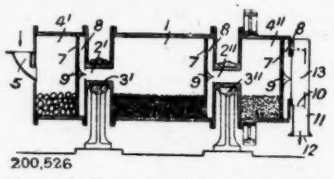
A free carboxylic acid is treated with a sulphochloride in the presence of a solid diluent such as alkali chloride, neutral sulphate, and pyrosulphate, kaolin or sand, to produce carboxylic acid chlorides. The proportions used are two molecular proportions of the sulphochloride to one molecular proportion of the carboxylic acid. In one example acetyl chloride is obtained by slowly adding glacial acetic acid to a heated mixture of sodium chlorosulphonate and sodium chloride, and then distilling. The product is condensed in a series of condensers cooled by water, a freezing liquid, and solid carbon dioxide or liquid air. The crude product is rectified. Another example is given using sodium pyrosulphate instead of sodium chloride. The residue may be used as a diluent for the next operation. In another example, acetyl chloride is obtained by distilling a mixture of *p*-toluenesulphochloride or benzene sulphochloride, sodium chloride, and glacial acetic acid. The residue contains *p*-toluenesulphonic acid anhydride. In a similar manner chloroacetyl chloride, propionyl chloride, or butyryl chloride may be obtained by using the corresponding acid.

200,524. AGGLOMERATING ORES. P. Jung, 39, Mainzer Strasse, Neukölln, Berlin. International Convention date, July 8, 1922.

A binding material for ores, furnace dust, etc., consists of the product obtained by grinding silicic acid, alumina, iron peroxide, or aluminium silicate to a slimy dispersion with water. When pressing the product an electric current is passed through it to facilitate expulsion of water.

200,526. GRINDING OR CRUSHING. J. S. Fasting, 9, Monrads Alle, Valby, near Copenhagen. International Convention date, July 10, 1922.

Material to be ground is fed through a pipe 5 to a chamber 4′ of a ball mill supported on trunnions 2′, 2″. The material passes through a screen 7 to a space 8, having lifting vanes which deliver it through the hollow trunnion 2′ to the next



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chamber 1. The grinding chambers are provided with balls of decreasing size, and the material is finally delivered to a sieve 10 in a stationary chamber 11. Tailings are removed periodically from the sieve 10 through an opening 13.

LATEST NOTIFICATIONS.

203,301. Manufacture of white lead. Lloyd, G. F., Clapp, F.B., and Campbell, F. H. August 30, 1922.
203,310. Manufacture of resins. Society of Chemical Industry in Basle. September 1, 1922.
203,340. Process for the production of white lead. Rascher, H., and Plaveln, R. September 3, 1922.
203,346. Manufacture of cellulose derivatives. Lilienfeld, Dr. L. April 2, 1921.
203,347. Manufacture of cellulose derivatives. Lilienfeld, Dr. L. April 2, 1921.

Specifications Accepted, with Date of Application

175,987. Recovering liquid solutes from non-aqueous solutions, Process of. Silica Gel Corporation. February 25, 1921.
180,680. Zinc oxide, Manufacture of. New Jersey Zinc Co. May 27, 1921.
181,014. Urea or its derivatives and formaldehyde, Manufacture of condensation products from. F. Pollak. May 31, 1921.
202,664. Iron chromium alloys, Manufacture of. W. A. Saltrick. February 23, 1922.
202,667. Reduction of ores. Sir E. P. C. Girouard and F. W. S. Jones. February 28, 1922.
202,678. Sodium compound and a new composition containing the same, Process and manufacture of. H. E. Cocksedge. April 22, 1922.
202,710. Soap manufacture. A Welter. May 20, 1922.
202,734. Vat dyestuffs and their intermediate products, Process for producing. S. Sokal. (*Kalle & Co. Akt.-Ges.*). May 25, 1922.
202,738. Distillation or heat treatment of carbonaceous and other materials, Processes and apparatus for. H. Nielsen and B. Laing. May 25, 1922.
202,793. Drying process or apparatus. T. Rigby. June 26, 1922.
202,795. Volatile oils from coal-gas, natural gases, or other similar gases, Process of extracting. K. Ikeda, H. Isobe and T. Okazawa. June 27. 1922.
202,882. Electrolysis apparatus. J. P. Scott. October 24, 1922.

Applications for Patents

Barnickel and Co., W. S., and Bloxam, A. G. Treating petroleum emulsions. 22259. September 4.
Beckett, E. G., Scottish Dyes, Ltd., and Thomas, J. Production of anthraquinone derivatives. 22166. September 3.
Chemische Fabrik Griesheim-Elektron. Production of aluminium-fluoride-alkali-fluoride double compounds free from iron. 22616. September 8. (Germany, September 8, 1922.)
Helbronner, A., Jouve, A. J. B., and Soc. Hydro-Electrique et Metallurgique du Palais. Manufacture of chromates, etc. 22625 and 22626. September 8. (France, November 23, 1921.)
Keller, A. Manufacture of sulphuric acid. 22429. September 6.
Lilienfeld, L. Manufacture of cellulose derivatives. 22160 and 22161. September 3. (Austria, April 2, 1921.)
Norske Molybdenprodukter Aktieselskabet. Alloys of molybdenum. 22322. September 5. (Germany, March 26, 1921.)
Paisley Oil and Chemical Co., Ltd. Waterproofing composition. 22431. September 6.
Tokalon, Ltd. Manufacture of oleo stearate or glyceryl. 22447. September 6.

Patents Court Cases

APPLICATION has been made under Section 24 of the Patents and Designs Acts, 1907 and 1919, for the following patents to be indorsed " Licences of Right " : 150,708 (Chemische Fabrik Röhm and Haas), relating to the manufacture of alkylene cyanhydrins ; 151,259 (Det Norske Aktieselskab for Elektrokemisk Industri Norsk Industri Hypotekbank) relating to a process for the production of alumina from aluminium nitrate solutions.

Market Report and Current Prices

Our Market Report and Current Prices are exclusive to THE CHEMICAL AGE, and, being independently prepared with absolute impartiality by Messrs. R. W. Greeff & Co., Ltd., and Messrs. Chas. Page & Co., Ltd., may be accepted as authoritative. The prices given apply to fair quantities delivered ex wharf or works, except where otherwise stated. The current prices are given mainly as a guide to works managers, chemists, and chemical engineers; those interested in close variations in prices should study the market report.

London, September 13, 1923.

THE improvement in the demand for chemicals has been maintained, and appears to be growing. On the whole the outlook has distinctly improved. The export markets are without special feature. There has been some inquiry for Japan, but the outlook is uncertain.

General Chemicals

ACETONE is particularly scarce. Makers are well sold and the price has advanced.

ACID ACETIC has been in better demand at recent values.

ACID CITRIC is a slower market, but price seems to have reached bottom.

ACID OXALIC has been in better demand, price unchanged.

BARIUM CHLORIDE remains a firm market, with a fair export inquiry.

CREAM OF TARTAR is rather lower on realisations, and is also affected by the depreciation in continental exchanges.

FORMALDEHYDE is rather quieter, although there is a steady flow of orders of small dimensions.

LEAD ACETATE is quiet but unchanged.

LIME ACETATE is very firm and in short supply.

LITHOPONE is unchanged.

CARBONATE AND CAUSTIC POTASH are unchanged.

YELLOW PRUSSIATE OF POTASH.—A moderate business is reported, and the fall in price has been arrested.

SODA ACETATE is an active market and quite a substantial volume of business is reported.

PRUSSIATE OF SODA.—Quiet and uninteresting.

SODIUM SULPHIDE.—Unchanged.

ZINC SALTS are very firm and some makers are sold out for some distance ahead.

Pharmaceutical Chemicals

ACETYL SALICYLIC ACID is in steady demand at last prices.

BARBITONE is slightly easier on the spot.

BROMIDES.—There is a distinctly firmer tone on the Continent. Second-hand parcels are difficult to find at recent rates, and the leading German makers have advanced their quotations.

COCAINE continues firm, the advanced prices are readily paid.

HYDROQUINONE is advancing in sympathy with the raw material.

METHYL SALICYLATE in good demand; price at present unchanged.

OPIUM PRODUCTS.—Makers have advanced their prices to the basis of 10s. 6d. per oz. for morphine hydrochlor, 14s. 9d. per oz. for diacetylmorphine hydrochlor, 15s. 9d. per oz. for codeine pure cryst.

PHENAZONE.—Makers are sold well ahead. Some holders are asking advanced prices.

SODA SALICYLATE is firm.

VANILLIN.—More inquiry is reported; market unchanged.

Coal Tar Intermediates

The position is without special change since last week, and Continental buyers continue to be interested but are not inclined in every case, to pay the price for British goods.

ALPHA NAPHTHOL is very firm with some fair orders open for acceptance.

ALPHA NAPHTHYLAMINE is steady and the price unchanged.

ANILINE OIL continues in demand with spot supplies short.

BENZALDEHYDE.—Some small home inquiries have been received.

BENZIDINE BASE.—Export buyers are keenly interested.

BETA NAPHTHOL.—A few export inquiries are reported.

DIMETHYLANILINE has been a small home business at recent values.

NAPHTHIONATE OF SODA is very firm and in demand.

NAPHTHIONIC ACID has also been asked for.

NITRO BENZOL is steady.

PARAPHENYLENEDIAMINE is without special feature.

RESORCINE is in small request at recent prices.

Coal Tar Products

There is no change in the market for coal tar products since last week.

90% BENZOL is plentiful and is worth 1s. 4d. on rails, although buyers hesitate to buy even at this figure in view of the expected drop in the price of petrol.

PURE BENZOL is worth 1s. 7d. to 1s. 9d. per gallon on rails.

CREOSOTE OIL is worth 8¼d. to 8½d. per gallon on rails in the north, and 9¼d. to 9½d. in the south.

CRESYLIC ACID is easy at 1s. 10d. per gallon for the pale 97/99 quality, while the dark quality is worth 1s. 7d. to 1s. 8d. per gallon.

SOLVENT NAPHTHA is weak, business has been done at 1s. 2d. on rails.

HEAVY NAPHTHA is in poor demand and is worth 1s. 3d. on rails.

NAPHTHALENES are plentiful and slightly weaker, the crude qualities are worth £6 to £6 10s. per ton, while 74/76 and 76/78 m.p. qualities are worth about £7 10s. to £8 10s. per ton.

[*Current Market Prices on following pages.*]

Chilean Nitrate Market Improving

ACCORDING to the fortnightly report of Aikman (London) Ltd., dated September 7, the market has ruled quiet throughout the fortnight, the uncertainty evinced in continental exchanges checking business for next spring delivery. Business on the spot has, however, been satisfactory for the time of year and the European deliveries for August reached 53,000 tons, against 29,000 tons last year. Deliveries for the new nitrate year (July 1 to August 31) have thus started well, and for the world amount to 168,000 tons, against 98,500 tons last year and 142,000 tons in 1921. A few steamer parcels for near arrival have changed hands at £11 6s. 3d. to £11 9s., and for September-October shipment at £11 10s. per ton c.i.f. Antwerp-Hamburg range and at £11 15s. to £11 16s. per ton c.i.f. for special ports. The tendency at the close is decidedly better, with more inquiry from buyers. The market in the United States is reported steadier, and the improved price now quoted for cotton is expected to react favourably on the nitrate position, especially as the price of sulphate of ammonia in the United States, now quoted at about £18 per ton, is relatively dearer than nitrate. A decidedly better inquiry has been noticeable for f.o.b. during the last few days, and the Association have now sold the balance of the quantity offered for second half November delivery at 20s. 7d. per metric quintal, and about 16,000 tons for December delivery, making their sales during the fortnight about 41,000 tons. A total of 944,000 English tons has now been sold for shipment after July 1, 1923, divided as follows: 148,000 tons July, 172,000 tons each August and September, 197,000 tons each October and November, 54,000 tons December, and 4,000 tons January-March, 1924. The cheapest position now offered is 1s. 8d. December delivery at 20s. 9d. per metric quintal.

Lead Poisoning Decreasing

THE Hanley Coroner, at an inquest on Wednesday, on the body of William Porter, a pottery worker, said it was good to know that in the present conditions in the pottery trade a man could work in lead as Porter had done for a quarter of a century without leaving any trace of injury from lead in his body. That could not have been the case years ago when he first became the coroner for Hanley.

Dyestuffs for Amsterdam

THE British Commercial Secretary at The Hague announces that the Colonial Establishment at Amsterdam is inviting tenders for the supply of dyestuffs, ultramarine, carbonate of soda, and other articles. All information may be obtained at the Department of Overseas Trade, Old Queen Street, W.1.

Current Market Prices

General Chemicals

	Per	£	s.	d.		£	s.	d.
Acetic anhydride, 90–95%	lb.	0	1	4	to	0	1	5
Acetone oil	ton	80	0	0	to	85	0	0
Acetone, pure	ton	130	0	0	to	135	0	0
Acid, Acetic, glacial, 99–100%	ton	73	0	0	to	74	0	0
Acetic, 80% pure	ton	50	0	0	to	51	0	0
Acetic, 40% pure	ton	25	0	0	to	26	0	0
Arsenic, liquid, 2000 s.g.	ton	85	0	0	to	88	0	0
Boric, commercial	ton	48	0	0	to	52	0	0
Carbolic, cryst. 39–40%	lb.	0	1	1½	to	0	1	2½
Citric	lb.	0	1	6½	to	0	1	7
Formic, 80%	ton	50	0	0	to	51	0	0
Hydrofluoric	lb.	0	0	7½	to	0	0	8½
Lactic, 50 vol	ton	38	0	0	to	39	0	0
Lactic, 60 vol	ton	43	0	0	to	45	0	0
Nitric, 80 Tw	ton	26	0	0	to	27	0	0
Oxalic	lb.	0	0	6½	to	0	0	6½
Phosphoric, 1.5	ton	35	0	0	to	38	0	0
Pyrogallic, cryst.	lb.	0	5	9	to	0	6	0
Salicylic, technical	lb.	0	1	9	to	0	2	0
Sulphuric, 92–93%	ton	6	0	0	to	7	0	0
Tannic, commercial	lb.	0	2	3	to	0	2	9
Tartaric	lb.	0	1	3½	to	0	1	4
Alum, lump	ton	12	10	0	to	13	0	0
Chrome	ton	28	0	0	to	29	0	0
Alumino ferric	ton	7	0	0	to	7	5	0
Aluminium, sulphate, 14–15%	ton	8	10	0	to	9	0	0
Sulphate, 17–18%	ton	10	10	0	to	11	0	0
Ammonia, anhydrous	lb.	0	1	6	to	0	1	8
.880	ton	32	0	0	to	34	0	0
.920	ton	22	0	0	to	24	0	0
Carbonate	ton	32	15	0		—		
Chloride	ton	50	0	0	to	55	0	0
Muriate (galvanisers)	ton	35	0	0	to	37	10	0
Nitrate (pure)	ton	35	0	0	to	40	0	0
Phosphate	ton	65	0	0	to	68	0	0
Sulphocyanide, commercial 90%	lb.	0	1	1	to	0	1	3
Amyl acetate, technical	ton	280	0	0	to	300	0	0
Arsenic, white powdered	ton	73	0	0	to	75	0	0
Barium, carbonate, Witherite	ton	5	0	0	to	6	0	0
Carbonate, Precip.	ton	15	0	0	to	16	0	0
Chlorate	ton	65	0	0	to	70	0	0
Chloride	ton	15	10	0	to	16	0	0
Nitrate	ton	33	0	0	to	35	0	0
Sulphate, blanc fixe, dry	ton	20	10	0	to	21	0	0
Sulphate, blanc fixe, pulp	ton	10	5	0	to	10	10	0
Sulphocyanide, 95%	lb.	0	0	11	to	0	1	0
Bleaching powder, 35–37%	ton	10	7	6	to	10	17	6
Borax crystals, commercial	ton	25	0	0	to	—		
Calcium acetate, Brown	ton	13	0	0	to	14	0	0
Grey	ton	22	0	0	to	23	0	0
Carbide	ton	16	0	0	to	17	0	0
Chloride	ton	5	15	0	to	6	0	0
Carbon bisulphide	ton	35	0	0	to	40	0	0
Casein technical	ton	100	0	0	to	105	0	0
Cerium oxalate	lb.	0	3	0	to	0	3	6
Chromium acetate	lb.	0	1	1	to	0	1	3
Cobalt acetate	lb.	0	6	0	to	0	6	6
Oxide, black	lb.	0	9	6	to	0	10	0
Copper chloride	lb.	0	1	1	to	0	1	2
Sulphate	ton	26	0	0	to	27	0	0
Cream Tartar, 98–100%	ton	92	0	0	to	93	10	0
Epsom salts (*see* Magnesium sulphate)								
Formaldehyde, 40% vol.	ton	75	0	0	to	76	0	0
Formusol (Rongalite)	lb.	0	2	1	to	0	2	2
Glauber salts, commercial	ton	4	0	0	to	4	10	0
Glycerin crude	ton	65	0	0	to	67	10	0
Hydrogen peroxide, 12 vols.	gal	0	2	0	to	0	2	1
Iron perchloride	ton	18	0	0	to	20	0	0
Sulphate (Copperas)	ton	3	10	0	to	4	0	0
Lead acetate, white	ton	43	0	0	to	45	0	0
Carbonate (White Lead)	ton	43	0	0	to	45	0	0
Nitrate	ton	44	10	0	to	45	0	0
Litharge	ton	37	0	0	to	39	0	0
Lithophone, 30%	ton	22	10	0	to	23	0	0
Magnesium chloride	ton	3	10	0	to	3	15	0
Carbonate, light	cwt.	2	10	0	to	2	15	0
Sulphate (Epsom salts commercial)	ton	5	15	0	to	6	0	0
Sulphate (Druggists')	ton	8	0	0	to	9	0	0
Manganese Borate, commercial	ton	65	0	0	to	75	0	0
Sulphate	ton	45	0	0	to	50	0	0
Methyl acetone	ton	82	0	0	to	85	0	0
Alcohol, 1% acetone	ton	105	0	0	to	110	0	0
Nickel sulphate, single salt	ton	37	0	0	to	38	0	0
Ammonium sulphate, double salt	ton	37	0	0	to	38	0	0

	Per	£	s.	d.		£	s.	d.
Potash, Caustic	ton	30	0	0	to	32	0	0
Potassium bichromate	lb.	0	0	5½	to	0	0	6
Carbonate, 90%	ton	30	0	0	to	31	0	0
Chloride, 80%	ton	9	0	0	to	10	0	0
Chlorate	lb.	0	0	3½	to	—		
Metabisulphite, 50–52%	ton	65	0	0	to	70	0	0
Nitrate, refined	ton	38	0	0	to	40	0	0
Permanganate	lb.	0	0	10	to	0	0	10½
Prussiate, red	lb.	0	3	0	to	0	3	2
Prussiate, yellow	lb.	0	1	1	to	0	1	1½
Sulphate, 90%	ton	10	0	0	to	10	10	0
Salammoniac, firsts	cwt.	3	3	0	to	—		
Seconds	cwt.	3	0	0	to	—		
Sodium acetate	ton	25	0	0	to	25	10	0
Arsenate, 45%	ton	45	0	0	to	48	0	0
Bicarbonate	ton	10	10	0	to	11	0	0
Bichromate	lb.	0	0	4½	to	0	0	4½
Bisulphite, 60–62%	ton	21	0	0	to	23	0	0
Chlorate	lb.	0	0	3	to	0	0	3½
Caustic, 70%	ton	17	10	0	to	18	0	0
Caustic, 76%	ton	18	10	0	to	19	0	0
Hydrosulphite, powder	lb.	0	1	5	to	0	1	6
Hyposulphite, commercial	ton	10	10	0	to	11	0	0
Nitrite, 96–98%	ton	27	10	0	to	28	0	0
Phosphate, crystal	ton	16	0	0	to	16	10	0
Perborate	lb.	0	1	0	to	0	1	1
Prussiate	lb.	0	0	6½	to	0	0	6½
Sulphide, crystals	ton	8	10	0	to	9	0	0
Sulphide, solid, 60–62 %	ton	14	10	0	to	15	10	0
Sulphite, cryst.	ton	11	10	0	to	12	0	0
Strontium carbonate	ton	50	0	0	to	55	0	0
Nitrate	ton	50	0	0	to	55	0	0
Sulphate, white	ton	6	10	0	to	7	10	0
Sulphur chloride	ton	25	0	0	to	27	10	0
Flowers	ton	11	0	0	to	11	10	0
Roll	ton	9	15	0	to	10	10	0
Tartar emetic	lb.	0	1	2	to	0	1	3
Tin perchloride, 33%	lb.	0	1	1	to	0	1	2
Perchloride, solid	lb.	0	1	3	to	0	1	4
Protochloride (tin crystals)	lb.	0	1	4	to	0	1	5
Zinc chloride 102° Tw.	ton	20	0	0	to	21	0	0
Chloride, solid, 96–98%	ton	25	0	0	to	30	0	0
Oxide, 99%	ton	42	0	0	to	45	0	0
Dust, 90%	ton	50	0	0	to	55	0	0
Sulphate	ton	15	0	0	to	16	0	0

Pharmaceutical Chemicals

Acetyl salicylic acid	lb.	0	3	0	to	0	3	3
Acetanilid	lb.	0	1	6	to	0	1	9
Acid, Gallic, pure	lb.	0	3	0	to	0	3	3
Lactic, 1.21	lb.	0	2	3	to	0	2	6
Salicylic, B.P.	lb.	0	2	1	to	0	2	3
Tannic, leviss.	lb.	0	3	2	to	0	3	4
Amidol	lb.	0	7	9	to	0	8	3
Amidopyrin	lb.	0	12	0	to	0	12	6
Ammon ichthosulphonate	lb	0	1	10	to	0	2	0
Barbitone	lb.	0	17	6	to	0	18	6
Beta naphthol resublimed	lb.	0	1	9	to	0	2	0
Bromide of ammonia	lb.	0	0	7	to	0	0	7½
Potash	lb.	0	0	6	to	0	0	6½
Soda	lb.	0	0	7	to	0	0	7½
Caffeine, pure	lb.	0	10	9	to	0	11	0
Calcium glycerophosphate	lb.	0	5	9	to	0	6	0
Lactate	lb.	0	1	9	to	0	2	0
Calomel	lb.	0	4	0	to	0	4	3
Chloral hydrate	lb.	0	4	0	to	0	4	3
Cocaine alkaloid	oz.	0	19	6	to	1	0	0
Hydrochloride	oz.	0	16	6	to	0	17	0
Corrosive sublimate	lb.	0	3	8	to	0	3	10
Eucalyptus oil, B.P. (70–75% eucalyptol)	lb.	0	2	4	to	0	2	6
B.P. (75–80% eucalyptol)	lb.	0	2	5	to	0	2	8
Guaiacol carbonate	lb.	0	8	6	to	0	8	9
Liquid	lb.	0	8	9	to	0	9	3
Pure crystals	lb.	0	9	3	to	0	9	9
Hexamine	lb.	0	3	8	to	0	3	10
Hydroquinone	lb.	0	3	6	to	0	4	0
Lanoline anhydrous	lb.	0	0	7	to	0	0	7½
Lecithin ex ovo	lb.	0	17	6	to	0	19	0
Lithi carbonate	lb.	0	9	6	to	0	10	0
Methyl salicylate	lb.	0	2	3	to	0	2	6
Metol	lb.	0	9	0	to	0	10	0
Milk sugar	cwt.	4	2	6	to	4	5	0
Paraldehyde	lb.	0	1	5	to	0	1	6
Phenacetin	lb.	0	6	0	to	0	6	3
Phenazone	lb.	0	7	3	to	0	7	6
Phenolphthalein	lb.	0	6	9	to	0	7	0
Potassium sulpho guaiacolate	lb.	0	5	0	to	0	5	3
Quinine sulphate, B.P.	oz.	0	2	3	to	—		

	Per	£	s.	d.		£	s.	d.
Resorcin, medicinal	lb.	0	5	6	to	0	5	9
Salicylate of soda powder	lb.	0	2	6	to	0	2	9
Crystals	lb.	0	2	6	to	0	2	8
Salol	lb.	0	3	0	to	0	3	3
Soda Benzoate	lb.	0	2	4	to	0	2	6
Sulphonal	lb.	0	14	0	to	0	14	6
Terpene hydrate	lb.	0	1	9	to	0	2	0
Theobromine, pure	lb.	0	10	6	to	0	11	0
Soda salicylate	lb.	0	7	6	to	0	7	9
Vanillin	lb.	1	3	0	to	1	4	0

Coal Tar Intermediates, &c.

Alphanaphthol, crude	lb.	0	2	0	to	0	2	3
Refined	lb.	0	2	6	to	0	2	9
Alphanaphthylamine	lb.	0	1	6½	to	0	1	7
Aniline oil, drums extra	lb.	0	0	9	to	0	0	9½
Salts	lb.	0	0	9½	to	0	0	10
Anthracene, 40–50%	unit	0	0	8½	to	0	0	9
Benzaldehyde (free of chlorine)	lb.	0	2	6	to	0	2	9
Benzidine, base	lb.	0	4	9	to	0	5	0
Sulphate	lb.	0	3	9	to	0	4	0
Benzoic acid	lb.	0	2	0	to	0	2	3
Benzyl chloride, technical	lb.	0	2	0	to	0	2	3
Betanaphthol	lb.	0	1	1	to	0	1	2
Betanaphthylamine, technical	lb.	0	4	0	to	0	4	3
Crocein Acid, 100% basis	lb.	0	3	3	to	0	3	6
Dichlorbenzol	lb.	0	0	9	to	0	0	10
Diethylaniline	lb.	0	4	6	to	0	4	9
Dinitrobenzol	lb.	0	1	1	to	0	1	2
Dinitrochlorbenzol	lb.	0	0	11	to	0	1	0
Dinitronaphthalene	lb.	0	1	4	to	0	1	5
Dinitrotoluol	lb.	0	1	4	to	0	1	5
Dinitrophenol	lb.	0	1	6	to	0	1	7
Dimethylaniline	lb.	0	2	9	to	0	3	0
Diphenylamine	lb.	0	3	6	to	0	3	9
H-Acid	lb.	0	4	9	to	0	5	0
Metaphenylenediamine	lb.	0	4	0	to	0	4	3
Monochlorbenzol	lb.	0	0	10	to	0	1	0
Metanilic Acid	lb.	0	5	9	to	0	6	0
Metatoluylenediamine	lb.	0	4	0	to	0	4	3
Monosulphonic Acid (2.7)	lb.	0	8	6	to	0	9	6
Naphthionic acid, crude	lb.	0	2	6	to	0	2	8
Naphthionate of Soda	lb.	0	2	6	to	0	2	8
Naphthylamin-di-sulphonic-acid	lb.	0	4	0	to	0	4	3
Nevill Winther Acid	lb.	0	7	3	to	0	7	9
Nitrobenzol	lb.	0	0	7	to	0	0	8
Nitronaphthalene	lb.	0	0	11½	to	0	1	0
Nitrotoluol	lb.	0	0	8	to	0	0	9
Orthoamidophenol base	lb.	0	12	0	to	0	12	6
Orthodichlorbenzol	lb.	0	1	0	to	0	1	1
Orthotoluidine	lb.	0	0	10	to	0	0	11
Orthonitrotoluol	lb.	0	0	3	to	0	0	4
Para-amidophenol, base	lb.	0	8	6	to	0	9	0
Hydrochlor	lb.	0	7	6	to	0	8	0
Paradichlorbenzol	lb.	0	0	9	to	0	0	10
Paranitraniline	lb.	0	2	7	to	0	2	9
Paranitrophenol	lb.	0	2	3	to	0	2	6
Paranitrotoluol	lb.	0	2	9	to	0	3	0
Paraphenylenediamine, distilled	lb.	0	12	0	to	0	12	6
Paratoluidine	lb.	0	5	6	to	0	5	9
Phthalic anhydride	lb.	0	2	6	to	0	2	9
Resorcin, technical	lb.	0	4	0	to	0	4	3
Sulphanilic acid, crude	lb.	0	0	10	to	0	0	11
Tolidine, base	lb.	0	7	3	to	0	7	9
Mixture	lb.	0	2	6	to	0	2	9

Essential Oils and Synthetics

Essential Oils.		£	s.	d.
Anise	c.i.f. 1/9 spot	0	1	11
Bay		0	12	0
Bergamot		0	12	0
Cajaput		0	3	6
Camphor, white	firm, per cwt.	4	0	0
Brown	,,	3	15	0
Cassia	c.i.f. 10/- spot	0	11	6
Cedarwood		0	1	4½
*Citronella (Ceylon)	Sept.-Oct. shipment, 3/2, spot	0	3	11
(Java)	Sept.-Oct. shipment, 3/11, spot	0	4	2
Clove		0	7	6
Eucalyptus	firm	0	2	2
Geranium Bourbon		1	10	0
Lavender	firm	0	16	6
Lavender spike	easier	0	2	9
Lemon		0	2	11
Lemongrass	per oz.	0	0	2½
Lime (distilled)		0	4	0
Orange sweet (Sicilian)		0	12	0
(West Indian)		0	9	6

*Almost unobtainable.

		£	s.	d.
Palmarosa		1	3	0
Peppermint (American)	dearer	0	14	0
‡ Mint (dementholised Japanese)		0	13	0
Patchouli		1	10	0
Otto of Rose	per oz.	1	15	0
Rosemary		0	1	7
Sandalwood		1	6	0
Sassafras		0	6	6
Thyme	2/6 to	0	8	0

‡ Dearer and market very nominal, but tending easier.

Synthetics.				
Benzyl acetate		0	3	0
Benzoate		0	3	0
Citral		0	10	0
Coumarine		0	18	6
Heliotropine		0	8	0
Ionone		1	5	0
Linalyl acetate		1	2	6
Methyl salicylate	easier	0	2	6
Musk xylol		0	11	0
Terpeniol	easier	0	3	0

Liquidation of British Casein Co.

At the offices of the Board of Trade, Carey Street, London, on Wednesday, September 5, the statutory meeting of creditors was held under the liquidation of the British Casein Co. (1911), Ltd., 24, Great Dover Street, London. The winding up order was made on May 15, on the petition of Mander Brothers, paint and varnish manufacturers, of Wolverhampton.

The company was incorporated in February, 1911, with a nominal capital of £2,100 in shares of £1 each. The object was to acquire and carry on the business previously carried on by the British Casein Co., Ltd., manufacturers of, and dealers in, casein and milk products. The company was, in fact, a reconstruction of the British Casein Co., Ltd., which had been registered in 1907 with a capital of £2,000. The business of the old company was stated to have progressed favourably until 1910, when a serious loss was incurred. In February, 1911, it was decided to wind up the old company for the purpose of reconstruction, and the new company bought the goodwill, stock, and machinery for £2,000. The liquidator of the old company retained sufficient cash out of the assets to settle the outstanding liabilities. The purchase consideration of £2,000 was satisfied by the issue of 2,000 fully paid £1 shares to the shareholders of the old company. The new company acted principally as merchants in placing casein and milk products on the market, and to some extent bought the raw material and treated it by a chemical process. At first the business was profitable, and dividends were paid until 1917. Since the end of 1918 a Mr. Ouwehand had been the sole director, and although net profits were earned in 1919 and 1920, he said that the business gradually decreased owing to lack of working capital. The deficiency account showed a gross profit on trading from January 1, 1921, to the date of the winding up order of £2,083, but that was insufficient to meet the overhead charges, which amounted to £4,200. The net loss on trading during that period was £2,017. The statement of affairs showed liabilities of £1,817, of which £1,509 was due to trade creditors. The assets were returned at £945.

The Official Receiver stated that he had received a letter from a gentleman representing a firm in Buenos Ayres intimating that the company was indebted to them for £992. That claim was put into the statement of affairs as a contingent liability, and was not expected to rank for dividend, but evidently it would have to be added to the unsecured debts. The claim was in respect of 417 boxes of casein delivered after the winding up order was made, and sold by a firm of agents on behalf of the company.

The matter was left with the Official Receiver as liquidator.

New Anglo-American Cable

The new cable between Great Britain and America—the ends being fixed at Weston-super-Mare, Somerset, and Far Rockaway, Long Island—which it is expected will be in actual operation by September 15, will be the largest ever manufactured for deep sea cable work. Its components will include 4,000,000 lb. of copper, 1,800,000 lb. of gutta percha, and about 80,000 miles of iron and steel wires. The cable will be capable of transmitting 1,200 letters a minute—600 in each direction.

Scottish Chemical Market

The following notes on the Scottish Chemical Market are specially supplied to THE CHEMICAL AGE by Messrs. Charles Tennant and Co., Ltd., Glasgow, and may be accepted as representing the firm's independent and impartial opinions.

Glasgow, September 13th, 1923.

THE heavy chemical market remains quiet, and there is nothing of importance to record.

Prices both for home and continental products remain at about the same level as last week.

Industrial Chemicals

ACID ACETIC, Glacial 98/100%, £60 to £64 per ton in casks; 80% pure, £50 to £53 per ton; 80% technical, £47 to £48 per ton, c.i.f. U.K. ports, duty free.

ACID BORACIC.—Crystals or granulated, £48 per ton; powdered, £50 per ton, carriage paid U.K. stations, minimum ton lots.

ACID CARBOLIC (Ice Crystals).—Now quoted 1s. 2d. per lb. Rather better inquiry.

ACID CITRIC.—Unchanged at about 1s. 5¾d. per lb., less 5 per cent.

ACID FORMIC 80%.—Still on offer at about £50 to £51 per ton, ex store.

ACID HYDROCHLORIC.—In little demand. Price 6s. 6d. per carboy, ex works.

ACID NITRIC 80°.—About £23 10s. per ton, ex station, full truck loads.

ACID OXALIC.—Unchanged at about 6d. per lb. Very little inquiry.

ACID SULPHURIC.—144°, £3 15s. per ton; 168°, £7 per ton, ex works, full truck loads. De-arsenicated quality, 20s. per ton more.

ACID TARTARIC.—B.P. crystals. Inclined to be lower at about 1s. 2d. per lb., less 5 per cent.

ALUM, CHROME.—Moderate export inquiry. Price about £23 to £27 per ton, f.o.b., according to quantity.

ALUM, POTASH (Lump).—Quoted about £10 per ton, c.i.f. U.K. ports. Spot lots about £11·10s. per ton. ex store.

AMMONIA, ANHYDROUS.—In little demand. Unchanged at about 1s. 5d. per lb.

AMMONIA CARBONATE.—Lump, 4d. per lb.; ground, 4½d. per lb., delivered. Moderate export inquiry.

AMMONIA LIQUID 880°.—Quoted 3¾d. per lb., ex station.

AMMONIA MURIATE.—Grey galvanisers quality now quoted £31 to £32 per ton. Fine white crystals about £23 15s. per ton, c.i.f. U.K.

AMMONIA SULPHATE.—25¼%, £12 17s. per ton; 25¾%, neutral quality, £14 per ton, ex works, August/September.

ARSENIC, WHITE POWDERED.—Now offered at about £70 per ton, ex wharf. Spot lots quoted £72 to £73 per ton, ex store.

BARIUM CHLORIDE 98/100%.—Unchanged at about £15 per ton, ex Store. Spot delivery.

BARYTES.—Finest white English £5 5s. per ton, ex works.

BLEACHING POWDER.—Spot lots £11 5s. per ton, ex station. Contracts 20s. per ton less.

BORAX.—Granulated, £24 10s. per ton; crystal, £25 per ton; powdered, £26 per ton, carriage paid U.K. stations. Minimum ton lots.

CALCIUM CHLORIDE.—English make unchanged, £5 12s. 6d. per ton, ex station. Continental material now quoted about £5 per ton, c.i.f. U.K.

COPPERAS, GREEN.—About £2 2s. 6d. per ton, f.o.b. U.K. port.

FORMALDEHYDE 40%.—Spot lots on offer at about £94 to £95 per ton, ex wharf.

GLAUBER SALTS.—Fine white crystals quoted £3 15s. per ton, ex store.

LEAD, RED.—English makers advance price by £1 per ton, now £40 per ton, carriage paid U.K. stations. Continental material about £35 per ton, ex store.

LEAD, WHITE.—Continental material now quoted £36 15s. per ton, c.i.f. U.K. ports.

LEAD ACETATE.—White crystals quoted £40 to £41 per ton, ex wharf, spot delivery. Offered from continent at £39 10s. per ton c.i.f. U.K.

MAGNESITE, GROUND CALCINED.—English burnt material £8 5s. per ton, ex station. Finest continental about £7 5s. per ton, c.i.f. U.K. ports.

MAGNESIUM CHLORIDE.—Offered from continent at about £3 per ton, c.i.f. U.K. ports. Spot material now quoted about £3 5s. per ton, ex store.

MAGNESIUM SULPHATE (Epsom Salts).—Commercial quality £7 per ton, B.P. quality, £8 5s. per ton, ex station.

POTASH, CAUSTIC 88/92%.—Continental quotations higher at about £29 per ton, c.i.f. U.K. ports. Spot lots about £32 per ton, ex wharf.

POTASSIUM BICHROMATE.—Unchanged at 5¾d. per lb. delivered.

POTASSIUM CARBONATE 96/98%.—Offered from continent at £27 per ton, c.i.f. U.K. ports. Spot material about £29 10s. per ton, ex store.

POTASSIUM CHLORATE.—Unchanged at about 3d. per lb.

POTASSIUM PERMANGANATE.—B.P. crystals now quoted 10¼d. per lb., ex store.

POTASSIUM PRUSSIATE (YELLOW).—Unchanged at about 1s. 1d. per lb., ex store.

SODA, CAUSTIC.—76/77%, £19 7s. 6d. per ton; 70/72%, £17 17s. 6d. per ton; 60/62% broken, £19 2s. 6d. per ton; 98/99% powdered, £22 15s. per ton. All ex station, spot delivery. Contracts, 20s. per ton less.

SODIUM ACETATE.—Offered at £25 per ton, ex store. Spot delivery about 20s. per ton less for prompt shipment from the continent.

SODIUM BICARBONATE.—Refined recrystallised quality £10 10s. per ton, ex quay or station. M.W. quality 30s. per ton less.

SODIUM BICHROMATE.—Unchanged at 4½d. per lb. delivered.

SODIUM CARBONATE.—Soda crystals, £5 to £5 5s. per ton, ex quay or station. Alkali 58%—Reduction of 1s. 3d. per ton. Now £8 14s. 9d. per ton, ex quay.

SODIUM HYPOSULPHITE.—Now offered at £8 per ton, c.i.f. U.K. ports. Spot lots about £10 per ton, ex store. Pea crystals, £14 10s. per ton, ex store.

SODIUM NITRATE.—Refined 96/98% unchanged at about £13 7s. 6d. per ton, f.o.r. or f.o.b. U.K. port.

SODIUM NITRITE, 100%.—Quoted £26 10s. to £28 10s. per ton, according to quantity.

SODIUM PRUSSIATE (Yellow).—Unchanged at about 6¼d. per lb., ex store.

SODIUM SULPHATE (Saltcake).—Price £4 per ton, ex station, for home consumption. Good export inquiry and higher prices obtained.

SODIUM SULPHIDE.—Offered from continent at about £14 per ton, c.i.f. U.K. ports. Spot lots about £14 15s. per ton, ex store.

SULPHUR, Flowers, £10 per ton; roll, £9 per ton; rock, £9 per ton; ground, £8 per ton; prices nominal.

TIN, CRYSTALS.—Unchanged at 1s. 4d. per lb.

ZINC SULPHATE.—Offered from continent at about £13 per ton, c.i.f. U. K. ports. Spot lots quoted £14 per ton.

NOTE.—The above prices are for bulk business, and are not to be taken as applicable to small parcels.

Coal Tar Intermediates and Wood Distillation Products

ANTHRANILIC ACID.—Small home inquiries. Price quoted 8s. per lb. 100 per cent. basis, carriage paid.

ANTHRAQUINONE.—Large export inquiries. Price quoted 2s. 4d. per lb., f.o.b.

DIMETHYLANILINE.—Home inquiry. Price quoted 2s. 10d. per lb., delivered, returnable drums.

DINITROCHLORBENZOL.—Some export inquiries. Price quoted £90 per ton, f.o.b.

DIPHENYLAMINE.—Supplies are offered at 3s. 6d. per lb., delivered.

G SALT.—Export inquiry. Price quoted 3s. 3d. per lb. 100 per cent. basis, f.o.b.

H ACID.—Moderate home demand. Price quoted 4s. 10d. per lb. 100 per cent. basis, delivered.

META PHENYLENEDIAMINE.—Export and home inquiries. Price 5s. 3d. per lb. 100 per cent. basis, delivered.

NEVILLE WINTHER ACID.—Home inquiries. Price 6s. per lb. 100 per cent. basis, carriage paid.

PHTHALIC ANHYDRIDE.—Small home inquiries. Price 2s. 4d. per lb., delivered.

PARA TOLUIDINE.—Small export inquiry. Price 5s. per lb., f.o.b.

R SALT.—Demand weak. Export inquiry. Price quoted 2s. 9d. per lb. 100 per cent. basis, f.o.b.

SULPHANILIC ACID.—Home inquiry. Price 1s. 1¼d. per lb. 100 per cent. basis.

The Manchester Chemical Market

(From Our Own Correspondent.)

Manchester, September 13, 1923.

Business on the chemical market here shows more life than at any time during August or, for that matter, for some time before then. Even now, however, things are very far from being really active. There is certainly more inquiry and rather more actual demand for home consumption and for shipment also, although buyers as yet are operating only on a comparatively small scale. In the meantime prices have continued fairly steady, with here and there a movement in favour of buyers.

Heavy Chemicals

Bleaching powder is in quietly steady demand at £11 5s. per ton to home users. Saltcake is quoted at £4 5s. to £4 10s. per ton, without attracting much attention from domestic users; export business, however, remains fairly good. Caustic soda continues active, foreign as well as domestic inquiry being on a satisfactory scale; prices for home consumption are unchanged at £16 7s. 6d. for 60 per cent. up to £19 7s. 6d. per ton for 76–77 per cent. material. Glauber salts are quiet but steady at round £4 per ton. Soda crystals are in much the same position at £5 5s. per ton delivered. Alkali is steady at £7 12s. 6d. per ton for 58 per cent. material, a steady demand being met with. Bicarbonate of soda is fairly active at £10 10s. per ton delivered. Prussiate of soda is dull but about unchanged at round 6d. per lb. Hyposulphite of soda continues featureless; photographic crystals are now quoted at about £14 and commercial at £9 10s. per ton. Sodium sulphide keeps quiet but steady at £14 10s. to £15 for 60–65 per cent. concentrated solid and about £8 per ton for crystals. Nitrite of soda keeps scarce and firm at £26 10s. per ton, a fair demand being met with. Chlorate of soda is steady and in moderate request at 2½d. to 2¾d. per lb. Phosphate of soda shows little sign of improvement, though prices are maintained at round £15 per ton. Bichromate of soda is steady at 4½d. per lb., a fair amount of business being put through. Acetate of soda is firm at £24 to £24 10s. per ton, supplies not being excessive.

In potash compounds caustic is firm and in active inquiry at £28 10s. to £29 per ton for 88–90 per cent. material. Carbonate of potash is steady at £27 for 90–92 per cent. and £29 per ton for 96–98 per cent., offers being fairly well taken up. Yellow prussiate of potash is still a dull section at 1s 1d. to 1s. 1½d. per lb. Permanganate of potash is only quiet in demand, though price is steady at 9½d. per lb. Chlorate of potash is moderately active at 2¾d. to 3d. per lb. Bichromate of potash is in fair demand at 5¾d. per lb.

Sulphate of copper continues dull, both for home and foreign business, though current prices are about unchanged at £25 10s. to £26 per ton, f.o.b. Arsenic keeps steady considering the offers of cheap Continental material; white powdered, Cornish makes, are still quoted at about £70 per ton, Manchester. Nitrate of lead meets with only a quiet demand at £42 per ton. Sugar of lead is very firmly maintained on paucity of offers for early delivery; white is quoted at £40 to £41 and brown between £42 and £43 per ton. Acetate of lime is also very firm at £20 to £21 for grey and £12 per ton for brown. Commercial Epsom salts are steady and moderately active at £4 per ton; magnesium sulphate, B.P., is still quoted at £6.

Acids and Tar Products

Both tartaric and citric acids are quiet and rather easier. Tartaric is offering at 1s. 1½d. to 1s. 2d. and citric at 1s. 5d. to 1s. 6d. per lb. Oxalic acid is still more or less featureless at 5½d. per lb. Acetic acid is steady and in fair demand at £47 to £48 per ton for 80 per cent. technical, and round £65 per ton for glacial.

In the coal-tar products section the position is about unchanged. Pitch is quiet so far as actual business is concerned, though inquiries are said to be numerous; the price is nominal at about £7 per ton, Manchester. Creosote oil is quiet at round 8½d. per gallon. Solvent naphtha is maintained at 1s. 4½d. per gallon, but little business is being done. Carbolic acid prices are very firm on scarcity of offerings; crude is quoted at 3s. 4d. per gallon and crystals at 1s. 2½d. per lb. Naphthalenes are quiet at £20 per ton for refined and £7 to £13 for crude.

Acetic Acid Supplies for British Malaya

With the exception of native rubber holdings and the possible exception of one or two large estates, all rubber latex produced in British Malaya is coagulated with acetic acid. During the war, when supplies of acetic acid were difficult to obtain, sulphuric acid came into general use. This acid is cheaper than acetic, but its use has been condemned by the Department of Agriculture of the Straits Settlements and Federated Malay States and also by the Rubber Growers' Association.

From the subjoined table it will be seen that the value of acetic acid imports has risen enormously since 1920. The sources from which the acid has been imported are interesting. In 1921 Canada furnished almost 50 per cent. of the supply, but by 1923 she has altogether ceased from competition in the market. The bulk of the acid is now supplied by European countries. Details as to the respective quantities exported by the different countries of the Continent in 1922 and 1923 are not yet available, but in 1921 the Netherlands and Germany were the only two European countries exporting the acid to Malaya. The value of Japanese acetic acid rose enormously in 1922, but has fallen again during the first half of the current year.

The following is a table of the values of acetic acid imported into British Malaya in 1921, 1922, and the first half of 1923, showing the countries of origin:—

	1921	1922	1923 (6 months)
	£	£	£
United Kingdom	390	7,920	4,792
British Possessions	11,332	540	Nil
Continent of Europe	3,819	80,347	52,213
U.S.A.	5,565	751	1,017
Japan	2,366	29,121	4,450
Other countries	Nil	245	Nil
Total	23,472	118,924	62,472

Exhibits at The Bristol First Exhibition

Capper, Pass and Son, Ltd., smelters and metal refiners, Bedminster, are represented at the Bristol First Exhibition by a stand on which an outstanding exhibit is "Chempur" tin, which assays about 99·988 per cent. of tin, and is claimed to be the purest metal of its kind in the market. The ingot is bright and entirely free from "frostiness" or spots. Softness of tin is commonly regarded as a criterion of purity. Physical tests made at Bristol University show "Chempur" to be 3·23 Brinnell as against 8·0 Brinnell found under similar conditions from a well-known brand of Straits tin. The ductility of "Chempur" is great. A cast test rod drew out to a knife edge under a load of 0·88 tons per square inch, giving an elongation of 86·5 per cent. A similar test piece of Straits tin gave an elongation of 52·5 per cent. under a load of 2·04 tons per square inch, and instead of the 100 per cent. reduction in area gave only 94·7 per cent. To meet the increased demand for "Chempur" tin Messrs. Capper, Pass and Son are extending their plant. At the same stand, too, are copper sulphate and tin protochloride crystals as well as specimens of ores treated at the same works.

Henry Richard and Co., Ltd., oil importers, blenders and refiners, Redcliffe Street, Bristol, who are the sole manufacturers of "Ristol" motor oils and greases and "Cast-o-grip" belt-food, are also exhibitors. The Richard family have successfully conducted the business for a hundred and five years in Redcliffe Street, but now, owing to increase of trade, they are moving to St. Philip's, Bristol.

Improved Trade in August

The official trade returns just issued for the month of August show a slight increase in the value of the general trade of the country, which does not, however, apply to the chemical exports. At the moment the detail figures are not available, but will be given next week. The value of the total imports in August, 1923, was £83,743,197, an increase of £6,127,293 on August, 1922. The import figure for chemicals, dyes, drugs and colours was £1,315,825, an increase of £190,804. The total value of the export trade was £60,103,360, being an increase of £71,123 over August, 1922; but chemicals, dyes, drugs and colours combined show a decreased value in exports amounting to £16,753 compared with last year, the total under this heading being £1,645,856.

Company News

RECKITT AND SONS.—The directors announce a dividend of 8d. per share, the same as a year ago.

UTAH COPPER CO.—A dividend of $1 is payable on September 29 to holders as of record September 14.

F. STEINER AND CO., LTD.—The ordinary general meeting will be held at Church Works, Church, on September 19 at 12.15 p.m.

BRITISH INSULATED AND HELSBY CABLES, LTD.—The directors announce an interim dividend of 1s. per share (5 per cent. actual) on the ordinary shares.

LEVER BROTHERS, LTD.—The transfer books of the company's registered first mortgage debenture stock will be closed from September 17 to September 30 (both dates inclusive).

PARKE'S DRUG STORES.—Payment will be made on September 20 of the dividend on the preference shares for the half-year ended August 31, at the rate of 6 per cent. per annum, less tax.

ZINC CORPORATION.—A dividend of 2s. per share is announced on the preference shares, being first half of the fixed preferential dividend of 20 per cent. for 1923, payable on October 15, less tax.

W. J. BUSH AND CO., LTD.—The share and debenture transfer books will be closed from September 21 to September 30, inclusive, for the preparation of the debenture interest and preference dividend warrants.

ABERTHAW AND BRISTOL CHANNEL PORTLAND CEMENT CO.—An interim dividend at the rate of 7½ per cent. is announced on the preference shares and 15 per cent. per annum for the half-year to June 30 last, both less tax, payable on September 30.

DIAMOND MATCH CO.—The London office of the National City Co. has received notification from its head office that the entire issue of the Diamond Match Co.'s 7½ per cent. gold debentures, due November 1, 1935, has been called for redemption on November 1 next, at 105 and accrued interest.

THE VEGLENE OIL REFINERY AND CHEMICAL WORKS, LTD.—At a general meeting of stockholders at Cardiff on September 5, a resolution for voluntary winding-up was passed. It was explained to the meeting that, by reason of the existing liabilities, the company could not continue its business. Mr. Ernest Clutterbuck, of Cardiff, was appointed liquidator.

SEAGER, EVANS AND CO.—The accounts for the year ending March 31 last show a loss of £11,988, which increases the debit balance on profit and loss account to £65,273; this amount, together with £11,385 written off certain assets, has been written off reserve fund, which now amounts to £38,272, after crediting £10,695 agreed excess profits returnable. For the previous year there was a loss of £8,977, and no dividend was paid.

STAVELEY COAL AND IRON CO., LTD.—The directors' report for the year ended June 30 last shows a profit, including the balance of the Coal Award, of £304,912, and £42,761 was brought in, making £347,673. An interim dividend was paid on February 10 last of 2½ per cent., and the directors now recommend a final dividend of 5 per cent., together with a diamond jubilee bonus of 2½ per cent., thus marking the sixtieth year of the company's operations. In future it is proposed to pay the interim dividend on March 30 instead of early in February as heretofore. It is proposed to allocate out of profits £100,000 to reserve fund, carrying forward a balance of £4,192. The report states that among other chemical developments, a plant for the manufacture of bleaching powder and caustic soda has been completed, also a new sulphuric acid plant, and these are all working very satisfactorily. The ordinary general meeting will be held at the Royal Victoria Station Hotel, Sheffield, on September 25, at 2 p.m.

NOBEL INDUSTRIES, LTD.—The directors' report for the year ended December 31, 1922, shows a profit of £1,157,137, after allowing for income tax deducted from dividends by the constituent and associated companies, and after providing for ascertained losses in respect of certain specific investments. After providing £177,000 interest paid and accrued to December 31 last upon the 8 per cent. 7-year secured notes, and writing off one-seventh of the cost of note issue, there remains £942,901, to which is added £463,349 brought forward. Dividend has already been paid on the preference shares on August 1, 1922, at the rate of 6 per cent. per annum for the half-year ended June 30, 1922, leaving a balance of £1,266,424. The directors recommend the following appropriations:—Preference share dividend at rate of 6 per cent. per annum for second half of 1922; ordinary share dividend at rate of 7 per cent. for the year; writing off balance of cost of 8 per cent. note issue, leaving balance of £559,018 now available, out of which £50,000 is put to reserve. The ordinary general meeting will be held at Winchester House, Old Broad Street, London, on Friday, September 21, at 12.30 p.m.

THE Stock Exchange Committee, under Rule 159, have sanctioned dealings in the following securities on the Exchange for cash or for account: Lever Brothers, 3,956,362 20 per cent. cumulative preference ordinary shares of 5s. each; and Low Temperature Carbonisation, 115,017 ordinary shares of £1 each, and 32,042 "A" preference shares of 10s. each.

Chemical Trade Inquiries

The following inquiries, abstracted from the "Board of Trade Journal," have been received at the Department of Overseas Trade (Development and Intelligence), 35, Old Queen Street, London, S.W.1. British firms may obtain the names and addresses of the inquirers by applying to the Department (quoting the reference number and country), except where otherwise stated.

LUBRICATING AND CYLINDER OIL.—H.M. Consul at Riga reports that the Latvian Railway Administration is calling for tenders for the supply of 400 tons of lubricating oil and 120 tons of steam cylinder oil. Applications for further particulars should be addressed to the Department of Overseas Trade, 35, Old Queen Street, London, S.W.1. (Reference No. 7986/F.R./C.C./2 should be quoted.)

SODIUM ACETATE FOR AUSTRALIA.—H.M. Senior Trade Commissioner in Australia reports that the Victorian Railways Commissioners are calling for tenders, to be presented before October 17, 1923, for the supply of 15 tons of sodium acetate (commercial). Applications from British firms for further particulars should be addressed to the Department of Overseas Trade, 35, Old Queen Street, London, S.W.1. (Reference D.O.T. 12039/E.D./C.P.)

CHEMICAL AND PHARMACEUTICAL PRODUCTS.—A Belgian firm in Brussels desires to secure the wholesale agency of British manufacturers of chemical and pharmaceutical products. Correspondence in English. (Reference No. 291.)

DEMAND FOR CREOSOTE IN BULGARIA.—H.M. Legation at Sofia reports that the Bulgarian State Railways are desirous of receiving tenders for the supply of 500 tons of creosote to the approximate value of 3,500,000 leva. A public adjudication of tenders will be held on September 28, 1923. Applications from British firms for further particulars should be addressed to the Department of Overseas Trade, 35, Old Queen Street, London, S.W.1. (Reference D.O.T. 11456/F.E./C.C./2.)

Tariff Changes

NEW ZEALAND.—The recent proposal to place duty on glass bottles and jars has been modified as follows: On and after January 1, 1924, empty plain glass bottles exceeding 8 oz. are to be subject to duty at the rate of 10 per cent. *ad valorem* under the British Preferential Tariff and at 25 per cent. under the General Tariff. As regards empty plain glass bottles not exceeding 8 oz. and plain glass jars, the proposed new rates have not been ratified, and these goods, therefore, remain as heretofore (British Preferential Tariff rate, free; General Tariff rate, 10 per cent.).

UNION OF SOUTH AFRICA.—A rebate of 2d. per gallon has been allowed on the import duty of motor spirit:—benzine, benzoline, naphtha, petrol, gasoline and petroleum spirit when mixed with spirit distilled in the union and intended for use in internal combustion engines.

THE BRITISH ALIZARINE COMPANY LTD.

Manchester London Glasgow

Manufacturers of Alizarine Dyestuffs

ALIZARINE RED (all shades)

ALIZARINE BLUES (soluble and insoluble)

ALIZARINE BORDEAUX

ALIZARINE CYANINE

ALIZARINE GREEN (soluble and insoluble)

ALIZARINE ORANGE

ALIZARINE RED S. POWDER

ALIZARINE BLUE BLACK

ALIZARINE (MADDER) LAKES (of all qualities)

ALIZARINE MAROON

ALIZUROL GREEN (Viridine)

ANTHRACENE BROWN

ALIZANTHRENE BLUE

ALIZANTHRENE BROWN

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Other fast colours of this series in course of preparation

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CHROME TANNING and other Chrome Compounds

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560 EAST LONDON
2667 DOUGLAS. GLASGOW

TELEGRAMS
BRITALIZ MANCHESTER
BRITALIZ LONDON
BRITALIZ GLASGOW

All communications should be addressed to

The British Alizarine Co., Ltd.
Trafford Park, Manchester

Commercial Intelligence

The following are taken from printed reports, but we cannot be responsible for any errors that may occur.

County Court Judgments

[NOTE.—The publication of extracts from the "Registry of County Court Judgments" does not imply inability to pay on the part of the persons named. Many of the judgments may have been settled between the parties or paid. Registered judgments are not necessarily for debts. They may be for damages or otherwise, and the result of bona-fide contested actions. But the Registry makes no distinction of the cases. Judgments are not returned to the Registry if satisfied in the Court books within twenty-one days. When a debtor has made arrangements with his creditors we do not report subsequent County Court judgments against him.]

BERESFORD, Thomas G. (trading as SURFO SOAP CO.), Grant Street, Leeds Road, Bradford, soap manufacturer. (C.C., 15/9/23.) £11 2s. 6d. July 4.

KERSHAW, Joseph, Old Mill, Eccleshill, Bradford, dyer. (C.C., 15/9/23.) £11 18s. 6d. August 1.

NORRIS BROTHERS, LTD., 107/111, Moorgate Station Chambers, chemical merchants. (C.C., 15/9/23.) £15 14s. 5d. August 3.

TURP, David, 61, Cross Street, Sudbury, whiting manufacturer. (C.C., 15/9/23.) £13 12s. 2d. June 27.

London Gazette

Companies Winding Up Voluntarily

GERMINOL PRODUCTS, LTD. (C.W.U.V., 15/9/23.) Andrew Bernard Marshall, 727, Fulham Road, London, S.W.6, appointed liquidator.

METALLURGICAL CO. (THE), LTD. (C.W.U.V., 15/9/23.) G. H. Warmington, liquidator.

MONKS, W. N., AND CO., LTD. (C.W.U.V., 15/9/23.) H. Whittaker, chartered accountant, 25, Acresfield, Bolton, appointed liquidator.

VEGLENE OIL REFINERY AND CHEMICAL WORKS, LTD. (C.W.U.V., 15/9/23.) S. E. Clutterbuck, 31, Queen Street, Cardiff, appointed liquidator.

WHEELTON COP DYEING AND BLEACHING CO., LTD. (C.W.U.V., 15/9/23.) W. Howarth, incorporated accountant, 21, The Square, St. Annes-on-the-Sea, appointed liquidator. Meeting of creditors at St. Annes Hotel, St. Annes-on-the-Sea, on September 22, at 2.30 p.m.

Bankruptcy Information

RICHARDSON, Thomas, lately carrying on business at Shorey Bank, Darwen, in the county of Lancaster, as THE EVERGLOSS CO., polish manufacturer. (R.O., 15/9/23.) Receiving order, September 5. Debtor's petition.

New Companies Registered

RADIOSAN, LTD., 25, Duke Street, St. James's, London, S.W. Chemical manufacturers. Nominal capital, £10,062 10s. in 10,000 10 per cent. cumulative preference shares of £1 each and 15,000 ordinary shares of 1d. each.

WILLIAMS PHARMACY, LTD. Chemists, druggists, dry-salters, oil and colour merchants, etc. Nominal capital, £100 in £1 shares. Solicitor: L. C. L. Sparks, 161*a*, Strand, London, W.C.

Photographic Chemicals for Brazil

A CONFIDENTIAL memorandum on the market for photographic materials in Brazil has been prepared by the Department of Overseas Trade from information received from the Commercial Secretary at Rio de Janeiro, the Acting British Consul at Para and the British Vice-Consuls at Manaos and Maranham, and issued to firms whose names are entered on its Special Register. United Kingdom firms desirous of receiving a copy of this memorandum, together with full particulars of the Special Register service and form of application for registration should communicate with the Department of Overseas Trade, 35, Old Queen Street, London, S.W.1.

Electro-Chemical Character of Corrosion

IN a paper on "The Electro-Chemical Character of Corrosion," by Mr. Ulick R. Evans, at the annual meeting of the Institute of Metals, in Manchester, on Wednesday, experiments were described which indicated that the corrosion of metals was mainly—probably entirely—electro-chemical in character. There were two main types. The type accompanied by evolution of hydrogen gas was characteristic of reactive metals placed in acid solutions, but the velocity varied greatly with the degree of purity of the metal. Where this type was impossible, slower corrosion could take place at a rate determined by the diffusion of oxygen to the metal, and comparatively independent of the purity. When a metal was immersed in a solution of potassium chloride, one could observe the production of alkali at the cathodic portions, the production of the chloride of the metal at the anodic portions, and the precipitation of hydroxide where these met. The electric current could be trapped and measured, and was found (by applying Faraday's law) to account for the greater part of the corrosion actually observed. Generally the cathodic areas were those to which air had free access, whilst the anodic areas were those protected from aeration. It was significant that corrosion usually proceeded most rapidly at the comparatively "unaerated" places—hence the intense corrosion observed in "pits" and over areas covered up by porous corrosion-products.

Research in South Africa

DR. GEORGE G. HAMPTON, of the Rockefeller Institute, who has recently completed an extended investigating tour in South Africa, paid a very remarkable tribute to the country and its people before leaving the Rand on his return to the States. The main object of the foundation, he explained, was "the betterment of mankind," and towards the attainment of this end the institute sends scientists to all countries where they could carry out investigations in the interest of public health; paying particular attention to soil pollution, diseases, typhoid, dysentery, and worm infections. In South Africa Dr. Hampton found the main problems to be malaria and miners' phthisis, and was greatly surprised at the advanced research work already in operation, as well as the opportunities available for the study of tuberculosis. He considered South Africa had the greatest area in the world for research work, and was impressed with the annual cost of £40,000 now spent by the Union Government on Sir Arnold Theiler's laboratories at Onderstepoort, just outside Pretoria. He had found a great and wide-awake people in South Africa.

Dyestuffs Licences During August

THE following statement relating to applications for licences under the Dyestuffs (Import Regulation) Act, 1920, made during August, has been furnished to the Board of Trade by the Dyestuffs Advisory Licensing Committee:—

The total number of applications received during the month was 391, of which 269 were from merchants or importers. To these should be added the 29 cases outstanding on August 1, making a total for the month of 420. These were dealt with as follows:—

Granted—282 (of which 248 were dealt with within seven days of receipt).

Referred to British makers of similar products—74 (of which 63 were dealt with within seven days of receipt).

Referred to Reparation supplies available—30 (all dealt with within two days of receipt).

Outstanding on August 31—34 (mostly dealt with at the meeting of the Committee held on August 31).

Of the total of 420 applications received, 341, or 81 per cent., were dealt with within seven days of receipt.

Australian Commonwealth Line of Steamers

IT is announced that in consequence of the Act transferring the management of the Commonwealth Government Line to a Board of Directors, the name of the Line is to be changed to the "Australian Commonwealth Line of Steamers."